ELECTRICAL CONSTRUCTION AND MAINTENANCE

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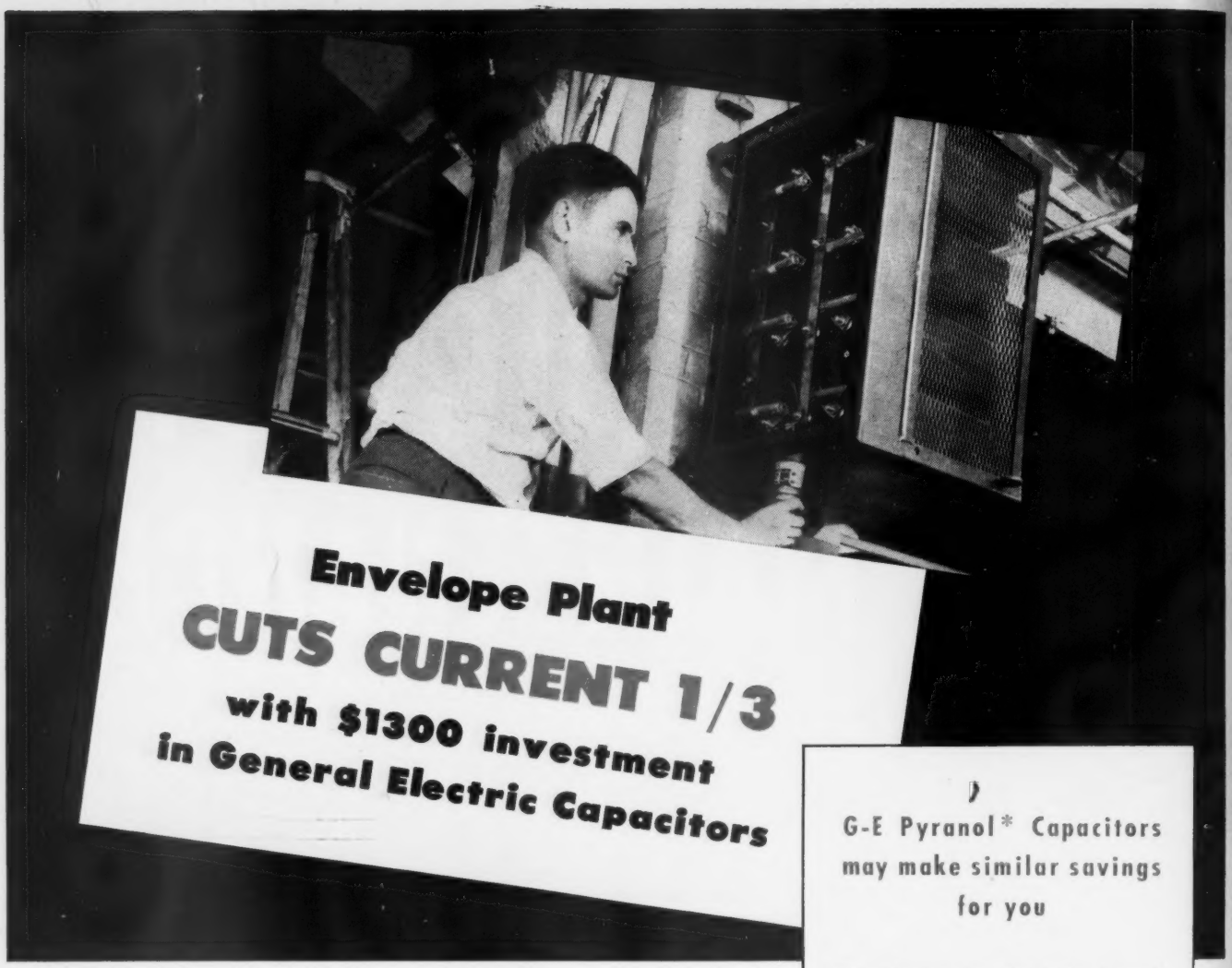
A McGRAW-HILL PUBLICATION



Envelope Plant CUTS CURRENT 1/3 with $1300 investment in General Electric Capacitors

The Standard Envelope Company of Cleveland wanted to expand but found its electrical system already overloaded. As new equipment was added, overheated switches and fuses began causing expensive shut-downs. Investigation showed that, even though many motors were only 1/20 hp, the total *magnetizing* current drawn by all 500 motors was about 500 amperes.

75 kvar of G-E capacitors were installed throughout the plant, close to the equipment, to supply this magnetizing current on the spot. *Total* current consumption immediately dropped one-third, and production returned to normal—with capacity to spare for further expansion.

And . . . a $336 bonus per year!

Capacitors, in supplying the necessary magnetizing current, raised the plant's power factor from 69.3 to 97 per cent. Because the power company gives a bonus for high power factor, this has resulted in a direct saving in power costs of $28 a month. The complete installed cost of the capacitors—$1300—will be repaid in less than four years *from this saving alone.*

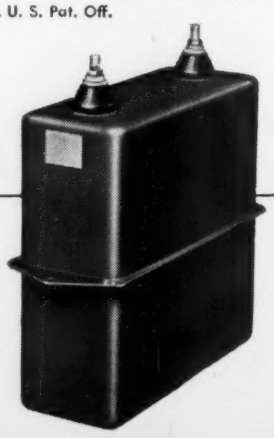
Standard Envelope's story is typical of hundreds of plants throughout the country that are realizing substantial benefits, including real monetary savings, through the use of G-E capacitors—in increased production, increased capacity, lower power costs—often all three. These quiet, reliable, non-flammable Pyranol capacitors may bring you these same benefits.

G-E Pyranol* Capacitors may make similar savings for you

If you have a power factor, kva demand or kilovar clause in your power contract, capacitors can save you money. If you have overloaded circuits, capacitors often provide relief—a 30% increase in circuit capacity is not unusual. If you are having trouble because of low voltage, capacitors may solve that too.

In any of these cases, a General Electric sales engineer will be glad to work with you in determining whether capacitors can help you, and just how much they will save. Just call your G-E representative, or write *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

***Reg. U. S. Pat. Off.**



GENERAL ELECTRIC

407-110

Murray
MODERN
METHODS *mean Highest Quality . . . Latest Design . . . Greatest Value!*

Now!

THE Murray 8 CIRCUIT

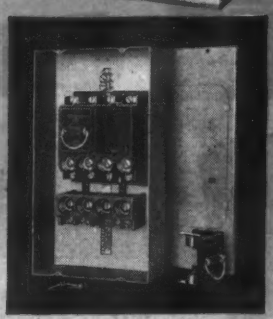
Combination Main Service and Range Switch

with

Extra Tap Connection for Hot Water Heater

Now you can equip today for tomorrow's bigger loads! The NEW Murray 8 Circuit Combination Main Service and Range Switch, for 125-250 volt service, provides for *eight* branch circuits, plus three-wire separately fused range connections. In addition, an extra tap simplifies hot water heater wiring . . . makes adding a heater later even simpler!

Yes, you can equip today for the loads of tomorrow — with the new Murray 8 circuit main service and range switch. For full details, contact your Murray representative, or write



Eight branch circuits, three-wire range connections, and an extra hot water heater tap are provided in this new Murray Main Service & Range Switch. Two styles for 60 amp. 125-250 volt 3 pole service — 100 amp. service lugs. Plenty of hand room for wiring all 8 circuits and range! For surface or flush mounting. Cat. No. 74-8 (Series); Cat. No. 77-8 (Parallel).

Murray

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SERVICE ENTRANCE & METER EQUIPMENT • MAGNETIC CIRCUIT BREAKERS
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Solves 15,000 wiring problems

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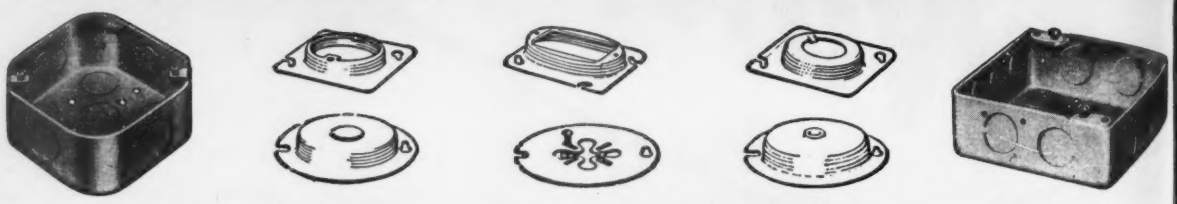
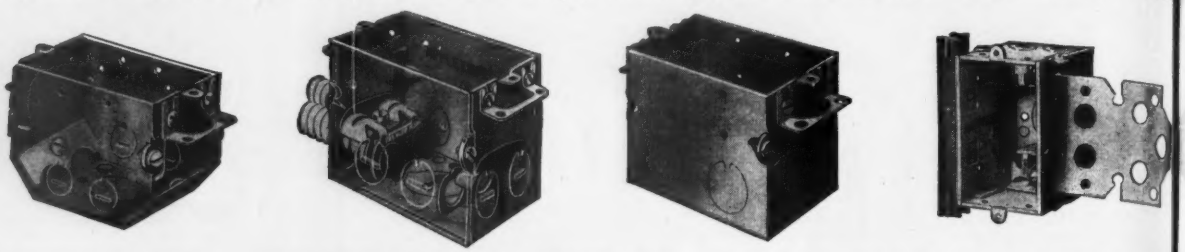


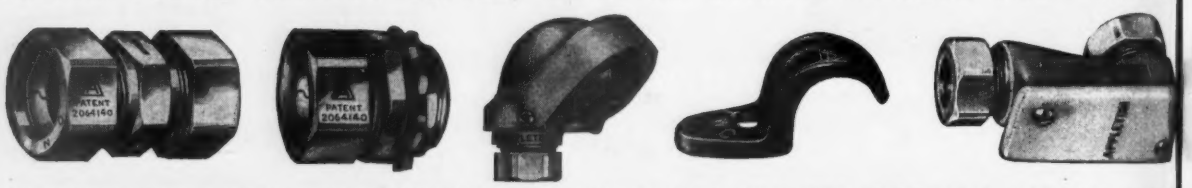
3¼ AND 4 INCH OCTAGONAL BOXES—4 AND 4 11/16 INCH SQUARE BOXES—WIDE SELECTION OF COVE

FOR EXAMPLE



SWITCH BOXES, VARIOUS DEPTHS, WITH OR WITHOUT CLAMPS AND BRACKE

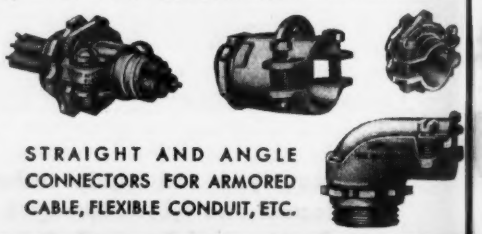
FOR EXAMPLE



COUPLINGS AND CONNECTORS, ENTRANCE FITTINGS, CLAMPS, ETC. FOR ELECTRICAL METALLIC TUBIN

FOR EXAMPLE

COUPLINGS, CONNECTORS, CLAMPS AND ENTRANCE FITTINGS FOR RIGID CONDUIT.



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A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering installations, repairing, maintenance and management in the field of electrical construction and maintenance.

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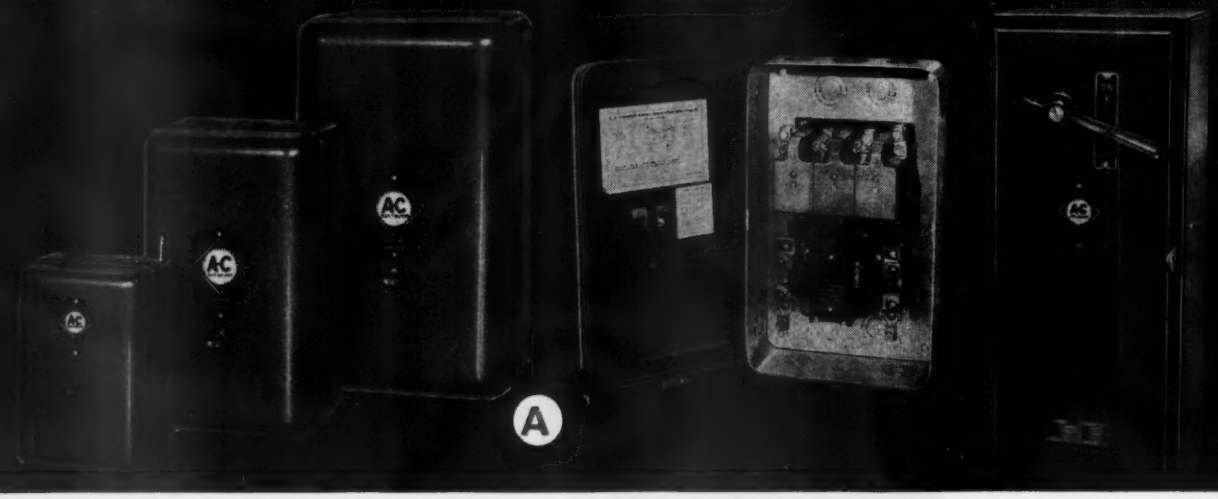
For indoor use—for ratings of 15 kva and up.

GENERAL ELECTRIC

411-52

TO CONTROL *ANY* MOTOR...



A GENERAL PURPOSE ACROSS-THE-LINE-STARTERS for *squirrel-cage motors*, or for use as primary switches on *wound rotor motors* are offered in Manual, Magnetic, Combination, Reversing, and Multi-speed types.

MANUAL STARTERS IN NEMA sizes 0 and 1 are offered in a variety of enclosures.

MAGNETIC STARTERS provide remote control, available in NEMA sizes 0 through 7 for motors to 600 hp.

COMBINATION STARTERS combine a full voltage magnetic starter and a disconnecting switch (either fusible or non-fusible) or an air circuit breaker, in a single enclosure.

REVERSING STARTERS for starting, stopping and reversing *squirrel-cage* motors to 200 hp. Also MULTI-SPEED STARTERS for two, three and four speed motors in Manual and Magnetic types.

B WHEN REDUCED VOLTAGE STARTING is a requirement, Allis-Chalmers offers a line of Manual and Magnetic Auto-Transformer Reduced Voltage Starters as well as Magnetic Primary Resistor Starters.

Specify an Allis-

Allis-Chalmers Offers Both Full and Reduced Voltage Starters for Squirrel-Cage and Synchronous Motors as well as Control for Wound Rotor Motors.

☛ **YOU GET WIDE SELECTION** of starter type, size and enclosure for each type motor.

☛ **YOU GET DEPENDABLE OPERATION!** Allis-Chalmers starters are generously designed, durably built.

☛ **EASE OF MAINTENANCE** results from *built-in* accessibility of renewable parts.

☛ **MANY PROTECTIVE FEATURES!** Overload, undervoltage, interlocking and other devices mean greater safety for equipment and personnel.

☛ **PLUS BROAD APPLICATION EXPERIENCE!** And that means the *right* starter for *your* job! Allis-Chalmers engineering experience on over 1600 products covers every major industry.

Pioneers in Power and Electrical Equipment From Generation Through Utilization

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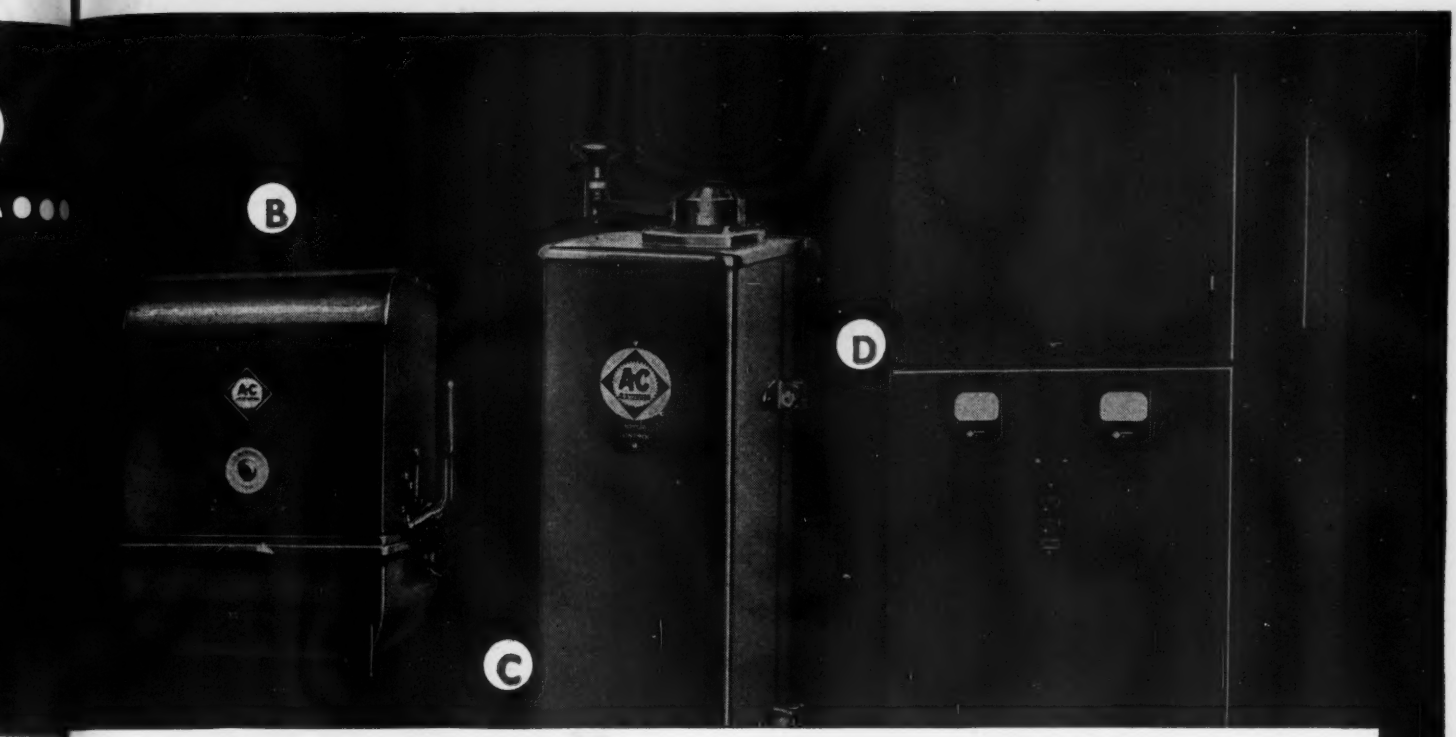

C FOR WOUND ROTOR MOTORS a wide variety of starters are offered. Typical are: Manual Primary and Secondary, Magnetic Primary and Secondary, Magnetic Primary with Manual Secondary, and Drum Type Reversing Primary and Secondary.

FOR SYNCHRONOUS MOTORS, three types of Starters are built by Allis-Chalmers: Full Voltage Magnetic, Reduced Voltage Semi-Magnetic, and Reduced Voltage Magnetic. All types are built in sizes to control motors from 20 to 3000 hp and feature positive synchronizing, maximum accessibility, easy adjustment, durable construction, automatic shut-down if starting sequence is incomplete, and other protective measures.

D HIGH INTERRUPTING CAPACITY STARTERS are built for High Voltage *squirrel cage, wound rotor* and *synchronous* motors. These starters have current limiting features and can be connected directly to circuits requiring up to 150,000 kva interrupting capacity at 2300 volts and 250,000 kva at 4160 to 4600 volts without a back-up circuit breaker.

Chalmers MOTOR STARTER!

THE NAME ALLIS-CHALMERS, throughout industry, stands for quality-built, lasting electrical equipment. You can depend on Allis-Chalmers Motor Starters to give you the same kind of performance. Here is exactly what we offer you:

Both Manual and Magnetic, Full and Reduced Voltage Starters for Squirrel-Cage and Synchronous Motors . . . Manual and Magnetic Starters for Wound Rotor Motors — all for widest possible range of horsepower and voltages.

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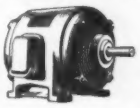

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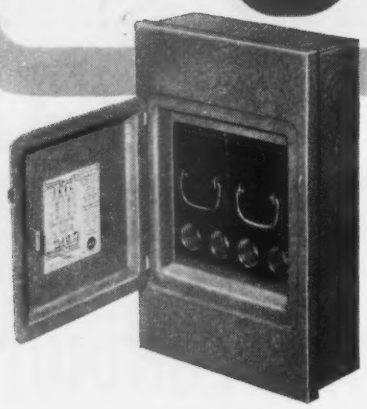

27162

No. 27162

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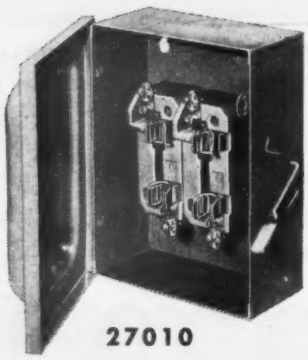
Branches — 0-30 Amps. — 125 Volts
Deadfront construction for complete safety.



27010

No. 27010

Raintight, general purpose units, with or without hubs. Boxes are weather-resistant galvannealed steel. Interiors are typical Arrow-Hart quality construction. Fusible models available with unfused switching neutral. **30 to 100 Amp. ratings, for 115, 125, 230 and 250 Volts.**

27200

No. 27200

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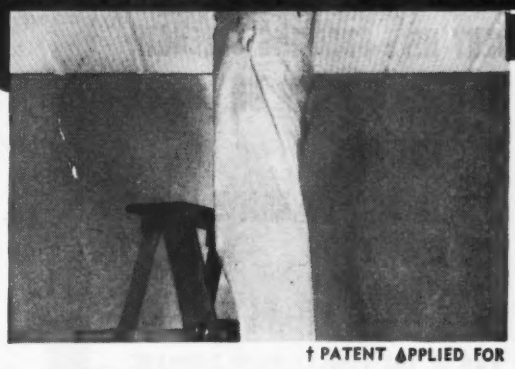
**Furnished, on special request, in colorfast hues for color schemes.*



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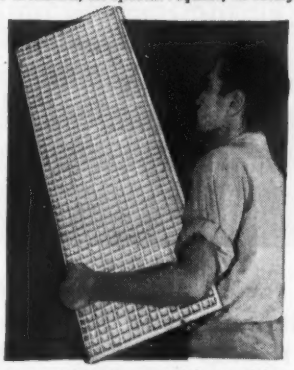

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The lightest weight over-all type fixture on the market, thanks to LEADER'S exclusive, one-piece *moulded translucent plastic louvers*. They are inflexible. Absolute uniformity, and more louvers per foot, achieving greater shielding of lamps, plus better diffusion of light, and no weight stress or strain on ceiling structure!

Leaderall LOUVERED LIGHT CEILING

A revolutionary application of fluorescent lighting—light by the square yard. An overall speedway of man-made sunbeams that speeds up worker efficiency. Calm, cool brilliance uninterrupted . . . A cheerful, May-morning sky throughout the year. Super-rich beauty, plus a new high in abundant light that's kind to eyes.

Send for mechanical details—today!

Leader Fluorescent Fixtures are sold and installed only by the better wholesalers and contractors.

LEADER ELECTRIC COMPANY

3500 N. KEDZIE AVENUE, CHICAGO 18, ILLINOIS

West Coast Factory: 2040 Livingston, Oakland 6, California

MITCHELL-RAND features...

MIRAGLAS* Cords

extremely low in cost... abundantly high in advantages

- VERY HIGH BREAKING STRENGTH
- WILL NOT STRETCH OR SHRINK
- WILL NOT ROT
- RESISTS OILS, CORROSIVE FUMES AND MOST ACIDS
- GOOD MOISTURE RESISTANCE

AND IS THE LOWEST-COST CORDAGE ON THE MARKET COMBINING ALL THESE ADVANTAGES

Manufacturers of electrical apparatus and appliances, repair and maintenance departments and rewind shops will find MIRAGLAS* CORDS ideal wherever a low-cost high quality binder twine or high strength tension member is required for . . .

banding field and armature coils... wrapping string bands on small armatures ...protecting front of commutator V-ring... reset strings...tying slot insulation . . . binding on V-ring extension...filling in winding coils...lashing ends of coils in large motors and generators – and when wax-treated for assembling and tying wire harnesses.

***MIRAGLAS* CORDS** are made by plying fine, strong, flexible fiberglas (filaments of glass) into twines ranging in size from .014" to .154" in diameter and available either treated or untreated. Treatments: oil, neoprene or wax.

*Woven of fiberglas

For MIRAGLAS* CORDS as for all other ELECTRICAL INSULATIONS you can depend upon MITCHELL-RAND "Electrical Insulation Headquarters" since 1889.

MITCHELL-RAND INSULATION CO. Inc.

61 MURRAY STREET • COrtlandt 7-9264 • NEW YORK 7, N. Y.

A PARTIAL LIST OF M-R PRODUCTS: FIBERGLAS VARNISHED TUBING, TAPE AND CLOTH • INSULATING PAPERS AND TWINES • CABLE FILLING AND POTHEAD COMPOUNDS • FRICTION TAPE AND SPLICE • TRANSFORMER COMPOUNDS • FIBERGLAS SATURATED SLEEVING • ASBESTOS SLEEVING AND TAPE • VARNISHED CAMBRIC CLOTH AND TAPE • MICA PLATE, TAPE, PAPER, CLOTH, TUBING • FIBERGLAS BRAIDED SLEEVING • COTTON TAPES, WEBBINGS AND SLEEVINGS • IMPREGNATED VARNISH TUBING • INSULATED VARNISHES OF ALL TYPES • EXTRUDED PLASTIC TUBING

Specify Vaportight *lighting* PYLETS

for *added* protection

For any indoor or outdoor location subjected to heavy concentrations of non-flammable vapors, gases, dusts or moisture, Pyle supplies a complete line of the highest quality industrial lighting fixtures delivering dependable and efficient illumination. Under these conditions vaportight lighting Pylets have an exceptionally long service life due to their heavy duty construction and especially efficient sealing features.

Bases are available in galvanized cast iron, aluminum alloy and bronze. Receptacles in porcelain and heavy duty molded bakelite. The bases have a large wiring chamber which remains vaportight even though the glass globe is broken or removed. The heavy guards, with or without shields, snap into a taper on the base and may be turned and locked in any position.

The superlative Pylet line for lamps from 10 to 200 watts includes a complete selection of hub arrangements, with or without a switch; varied types for conduit, outlet box, surface, wall and handrail mounting; single, two and three gang fixtures; four reflector styles; portable hand lamps; and midget fixtures for 10 watt lamps. Consult your Pylet catalog 1100 for complete listings.

SINCE 1897

THE PYLE-NATIONAL COMPANY

1344 NORTH KOSTNER AVENUE, CHICAGO 51, ILLINOIS

District Offices and Representatives in Principal Cities of the United States. Export Department: International Railways Supply Co., 30 Church St., New York. Canadian Agent: The Holden Co., Ltd., Montreal

PLUGS AND RECEPTACLES • FLOODLIGHTS • TURBO-GENERATORS • CONDUIT FITTINGS • MULTI-VENT AIR DISTRIBUTION

THE ONE BELL that meets every installation condition . . .

Whatever your requirements in a bell system, certain standards of tone, signal strength, mechanical dependability, installation factors, obviously determine your choice. Check the following features of the new Edwards Adaptabel—and see how faithfully they reflect the most critical requirements:

1. LOUDER & CLEARER.
Adaptabel's tone is pure and penetrating—easily heard above all clamor. Size for size, it's far louder than any bell now made. In fact, the 6" Adaptabel is more powerful than most 10" old-style bells!

2. FITS ALL MOUNTINGS.
Almost without exception, Adaptabel fits every standard conduit box, whether concealed or surface type. Mounting is equally simple in non-conduit work.

3. MECHANICALLY SUPERIOR.
Precision-built to a radically new (pat. pending) design that actually compensates for normal wear, Adaptabel has no springs or contacts to adjust . . . no exposed mechanism or connectors to rust, corrode or collect dirt.

4. CHOICE OF TYPES.
Edwards new Adaptabel is available in 4, 6 and 10" sizes—with voltages, as required, up to 250 volts, 60 cycles.

SIMPLE, ECONOMICAL INSTALLATION

1. Mount plate on wall or on any switchbox, outlet box, Condulet or Wiremold type fitting.

2. Connect wires. Large, convenient binding posts give plenty of working room.

3. Just slip Adaptabel on the sturdy hanger . . . nothing complicated.

4. Last step . . . just push Adaptabel home and secure with exposed screw. Job is finished.

EDWARDS

ADAPTABEL

FOR FACTORIES, OFFICES AND SCHOOLS

WRITE TODAY FOR ILLUSTRATED BULLETIN

EDWARDS COMPANY, INC., Norwalk, Conn.

In Canada: Edwards of Canada, Ltd.

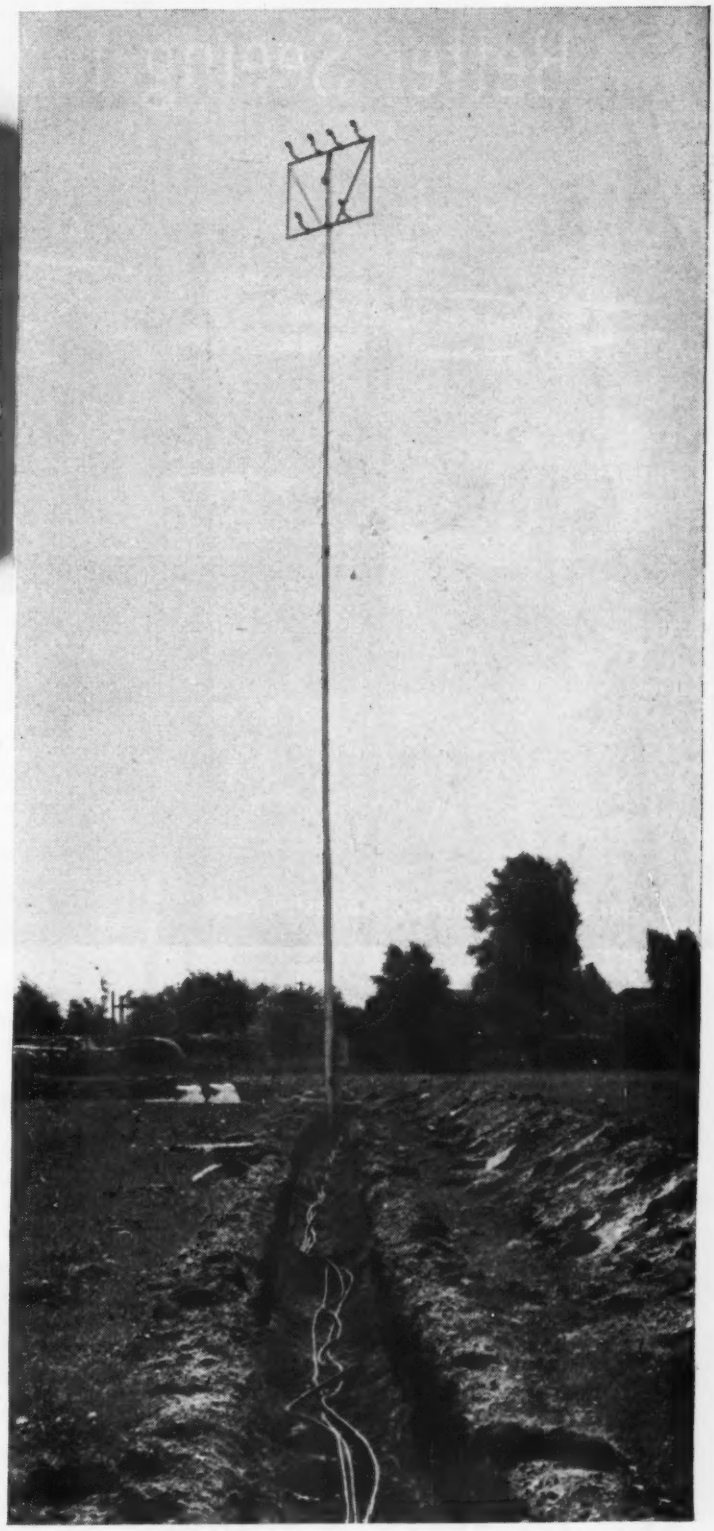
MORE DATA ON ALCOA EC ALUMINUM

on the job Today

Lighter weight, lower cost

Q *How much voltage drop do you get with ALUMINUM?*

A *Aluminum conductors two AWG sizes bigger than copper give you the same voltage drop . . and cost less, weigh less*



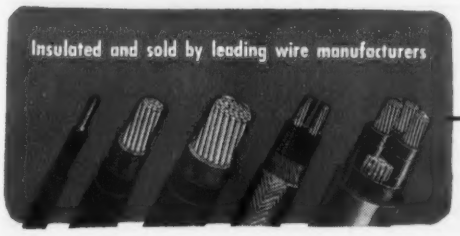
Wire and cable with Alcoa E.C.* Aluminum conductor give you lighter weight and lower cost, even when specified two AWG sizes bigger. And this gives you greater current-carrying capacity.

Similarly, aluminum two sizes bigger has tensile breaking strength greater than insulated copper. Joints and terminals can be soldered, welded, or made mechanically by standard methods with standard tools. Aluminum is easier to handle on the job because it weighs so much less.

Alcoa makes light, strong, conductive E.C. Aluminum; leading wire manufacturers draw, strand and insulate it, and sell it under their own trade-marks. Investigate the savings Alcoa E.C. Aluminum can give you! Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh 19, Pennsylvania.

*E.C.: *Electrical Conductor* Aluminum

220/110-volt secondary feeders for a softball field lighting system. Maximum run, 375', maximum voltage drop, less than 2 per cent. 300 mcm aluminum, insulated, direct burial.



ALCOA EC ALUMINUM

ALCOA ALUMINUM ®

FOR ELECTRIC WIRE AND CABLE

Better Seeing for **Better Selling**

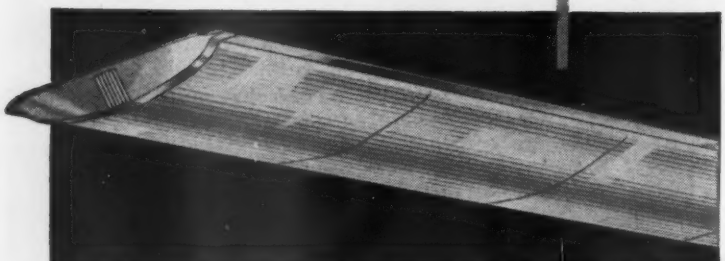
...for Brunwood Motors, Worcester, Mass.

Sleek, graceful lines of these Lincoln cars are emphasized by the longitudinal reflections from Litecontrol fixtures that parallel all display windows. For extra accent, strategically placed lens boxes add sparkle and life to the chrome fittings.

Consulting Engineer: R. E. Lupien . Electrical Contractor: Coghlin Electric Company . Lighting Equipment: Litecontrol No. 9134 recessed lens fixture with 3 lamps and supplementary 250 watt accent lights . Lamps: 40 watt, 3500 degree, white, fluorescent; 250 watt incandescent . Wattage per fixture: 150-fluorescent; 250-incandescent . Total Wattage: 7,600 . Watts per Square Foot: 5.4 . Footcandles: 80 Initially.

Every one of the many Litecontrol fixtures are good to look at — graceful and glare-free. Yet they are capable of putting plenty of lighting punch on working or selling areas. Extra sturdy in construction — easy to install — Litecontrol fixtures are also built for faster cleaning and easier servicing.

Litecontrol engineers are specialists in building sales through better lighting. And they'll be glad to help you with advice — or by furnishing complete lighting layouts. With their technical assistance you can help your customers sell more goods — help yourself sell better lighting to more customers.



...with LITECONTROL FIXTURE NO. 9134

Selected for this automobile showroom was a Litecontrol flush, troffer-type unit using Holophane Controlescent curved lenses. Its optical engineering gives excellent light distribution and reduced contrast between fixture and ceiling. Smooth graceful lines and shallow recess depth blend pleasingly into any modern architectural design.

Cat. No.	No. of Lamps	HOUSING Length	HOUSING Width	HOUSING Height	TRIM Length	TRIM Width	Weight
9124	2-40W	48"	13¼"	5⅝"	49½"	14¾"	46 lbs.
9134	3-40W	48"	13¼"	5⅝"	49½"	14¾"	51 lbs.

End Cap — No. 9100-3. Suspension Strap — No. 9100-6

LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

LITECONTROL *Fixtures*
KEEP UPKEEP DOWN

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

TRIANGLE'S NEWLY EXPANDED CONDUIT PLANT

Triangle Rigid Steel Conduit finish is hot dip galvanized, uniformly both *inside* and outside, with additional protection assured by a baked-on coat of specially prepared linseed oil base lacquer. Available in sizes from ½ to 6 inches, with couplings and elbows to fit.

Triangle Electric Metallic Thin Wall Conduit is welded from high grade steel strip, insuring a perfectly true tube of uniform thickness and strength. Hot dip galvanized uniformly both *inside* as well as outside. Threadless. Available in ½ through 2 inch sizes.

Now your requirements for rigid steel and thin wall conduit can be met faster, more dependably, since Triangle's newly expanded plant is in production. Located in Moundsville, W. Va., hard by the steel center of Wheeling, this enlarged manufacturing establishment incorporates latest advancements in production equipment to assure greater output and the uniformly high quality for which Triangle has been famous for over 30 years.

While output of steel conduit is at present limited by circumstances beyond Triangle's control, when these conditions change you can count on Triangle for an *immediate* increase in shipments. If there's a bottleneck in steel conduit, it won't be in Triangle's new Moundsville plant!

For *Extra* quality — at NO extra cost — insist on TRIANGLE!

NOW SERVES YOU Better, Faster!

If It Bears This Trade Mark *It's Made by Triangle . . .*

If It's Made by Triangle IT MUST BE RIGHT!

For latest information on deliveries, contact your nearest Triangle distributor or representative, or write

TRIANGLE CONDUIT & CABLE CO., INC.

1908 Jersey Avenue, New Brunswick, N. J.

ARTERIES FOR ELECTRICAL SYSTEMS — INCORPORATED

IT MUST BE RIGHT!

BUILDING WIRE • BARE WIRE • ARMORED CABLE • "GLAZON" TRIEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE, SERVICE DROP, VARNISHED CAMBRIC BRAIDED OR LEADED, TRIOPRENE TRENCH, POWER AND PARKWAY CABLES RIGID CONDUIT • ELECTRIC METALLIC THIN WALL CONDUIT • FLEXIBLE STEEL CONDUIT

must your cable

Standardize and Save

FLAMENOL—in all standard 600-volt constructions—is one of six modern cables mass-produced and authorized for warehouse stock. Standard designs permit quicker delivery and a lower price than special types. Each offers advantages in its recommended applications.

CORONOL®-GEOPRENE For high-voltage power distribution. Has superior resistance to heat, corona, and aging. Bulletins GEA-1788, GEA-4848.

VERSATOL®-GEOPRENE For low-voltage distribution and branch-circuit wiring to motors and controls. Resists moisture, heat, and aging. Bulletin GEA-4848.

INTERLOCKED-ARMOR For overhead power distribution throughout the plant. Needs no conduit, speeds installation. Bulletin GEA-4507.

VARNISHED-CAMBRIC LEADED For high-voltage feeders, distribution in underground ducts. Ideal for heavy loads in wet locations. Bulletin GEA-2623.

GEOPRENE CONTROL For connection between control panels and portable push-button stations on large machines. Resists rough handling and repeated flexing.

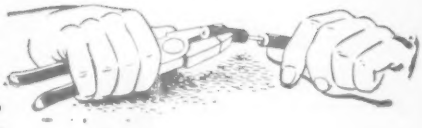
. . . stand up under cutting oils ?

Chemically inert G-E Flamenol® cable safeguards your low-voltage plant circuits against oils, cutting fluids, acids and alkalies.

. . . cut down fire hazards ?

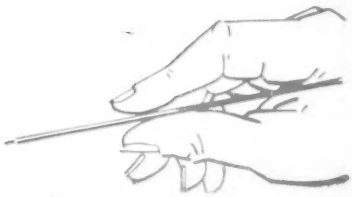
Flameproof Flamenol cable can't spread a fire, because it won't support combustion.

. . . save installation time ?



Flamenol cable strips cleanly to simplify terminating, and its hard, sleek finish makes pulling through raceways easy.

. . . fit in small space ?



With no added covering needed, Flamenol cable's smaller diameter saves space, makes for neater wiring.

It will if it's

Flamenol Cable

made only by General Electric

Wherever your plant wiring calls for low-voltage cable that's long-lasting under conditions as tough as they come—that's the place for G-E Flamenol cable. Thermoplastic-insulated Flamenol cable, made by General Electric, is completely controlled in the making, from raw material to finished product. That's why you get the uniform quality that assures greatest service reliability. For more information, write for Bulletin GEA-4352, or call your nearest G-E office. Section W27-618, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

"...galvanized conduit corroded"

so they switched to

ROCKBESTOS A.V.C.

Inner protective impregnated asbestos wall
High dielectric varnished cambric tapes
Outer protective impregnated asbestos wall

THE AVC SANDWICH

High dielectric tapes sealed from air by two asbestos insulating walls.

Where moisture, fumes and heat corroded galvanized conduit, a large Mid-western electric utility replaced ordinary rubber covered cables with this Rockbestos AVC.

The circuits were in a damp, low ceiling basement area adjacent to open ash hoppers and exposed to ash discharge belt conveyors. Moisture, heat, sulphur and other coal gasses corroded the galvanized conduit before it was covered with asphalt paint.

This company chose and installed Rockbestos AVC because its impregnated felted asbestos insulation forms impervious barriers protecting the high dielectric varnished cambric tapes from conditions that destroy ordinary insulations.

Another case where "low-cost" cables cost more in the end . . . where a switch to ROCKBESTOS AVC meant dependability—and *true economy*. Rockbestos AVC is doing the job.

You'll want to know the full Rockbestos Story — Write.

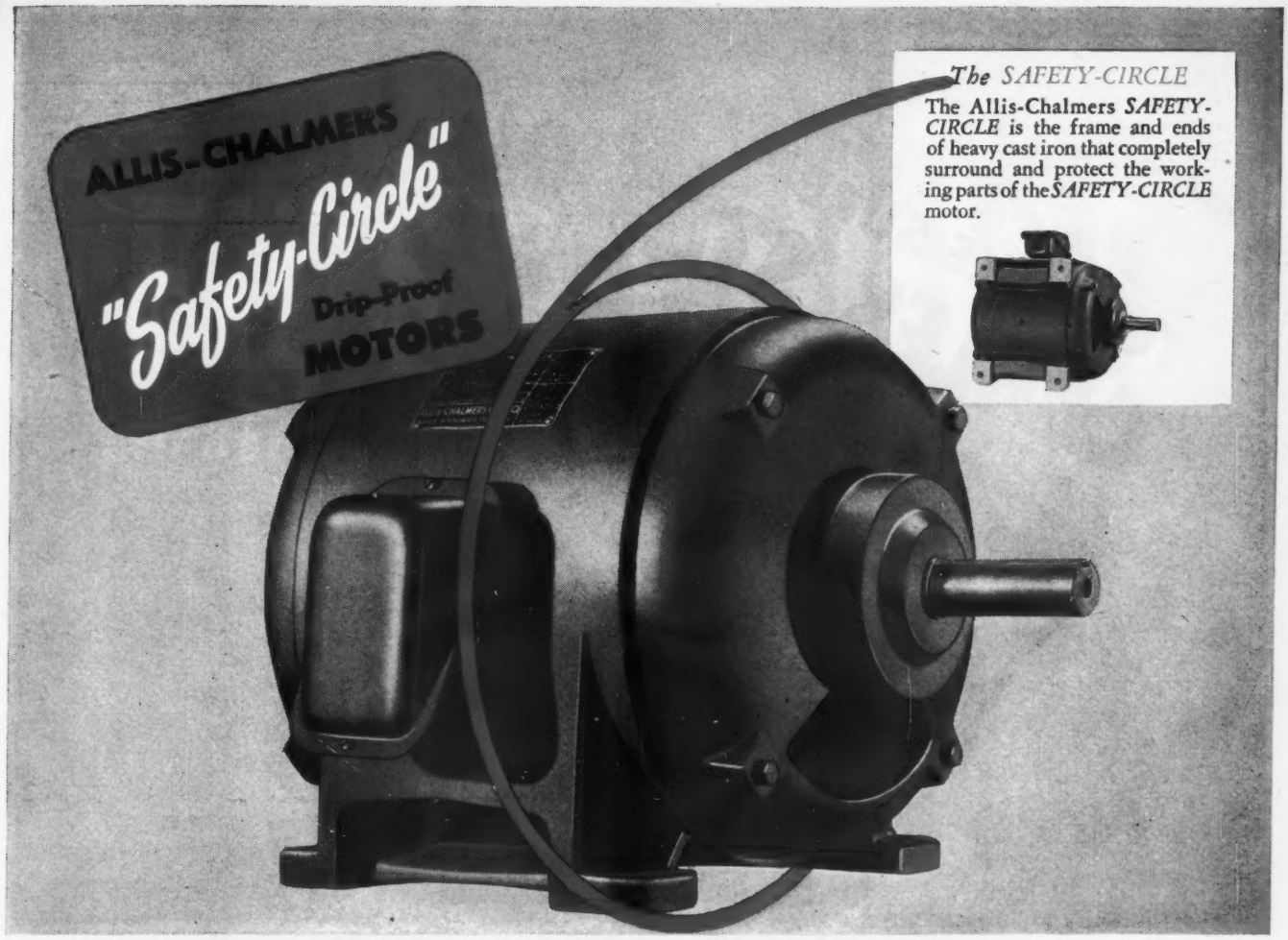
ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT

NEW YORK CLEVELAND DETROIT CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CALIF.

WIRES and CABLES *by*

ROCKBESTOS

. . . . dare to be better



The SAFETY-CIRCLE

The Allis-Chalmers *SAFETY-CIRCLE* is the frame and ends of heavy cast iron that completely surround and protect the working parts of the *SAFETY-CIRCLE* motor.

SAFETY-CIRCLE means

★ All-Around Protection ★ Low Maintenance ★ Dependable Performance

A-2690

THE *SAFETY-CIRCLE* MOTOR is protected all around against those four great motor killers — corrosion . . . distortion . . . friction . . . foreign matter. The frame is of cast iron, the most corrosion-resistant material for this purpose.

The strength and stiffness of the cast iron is supplemented by ribbing and bracing to maintain alignment and prevent distortion. Ball bearings are lubricated and sealed at the factory. They require no attention for years. End brackets are drip-proof at no premium.

SAFETY-CIRCLE motors are fully protected inside, too. Multiple-dipped and multiple-baked stator plus extra inter-phase insulation provide extra protection against electrical breakdown.

With *SAFETY-CIRCLE* protection outside and protected working parts inside, you can count on years of trouble-free, low cost power.

For complete details on *SAFETY-CIRCLE* advantages, see your A-C Authorized Dealer or Sales Office or write for Bulletin 51B6210B. Stocked in sizes 1 to 20 hp. *SAFETY-CIRCLE*, *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

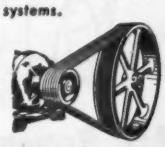
ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

3 WAYS TO MAKE SURE CABLES STAY PUT!

National Electrical Code paragraph 3014 specifies intervals at which cable supports must be used in vertical raceways.

When you're looking for a better way to hold cables fast, protect connections against pull or vibration—install O. Z. Cable Supports.

WHY?

BECAUSE O. Z. makes the *only* cable supports with one-piece impregnated maple plugs, machined to the exact wire size.

BECAUSE there is an O.Z. support for installation before or after pulling wire.

BECAUSE the serrated O. Z. liner provides a *positive* grip when plug is wedged home.

BECAUSE you can choose from three basic types the *best* support for your job—

1. **CONDUIT TYPE** for fast, easy installation on vertical runs. Screws directly on conduit. Malleable iron body grooved for tightening with screwdriver.
2. **LOCK TYPE** for use in *any* position. Threaded collar pressing against plug assures vibration-proof support under all conditions.
3. **SPLIT TYPE** for quick changeover jobs where cable is already installed. Body halves placed around cable, steel band fastened, and assembly placed on top of conduit.

There are thousands of O. Z. products designed to help you put power where you want it, and your O. Z. distributor is the man to see about them. Send for illustrated catalog.

5305

And Remember—They're O. K. If They're O. Z.

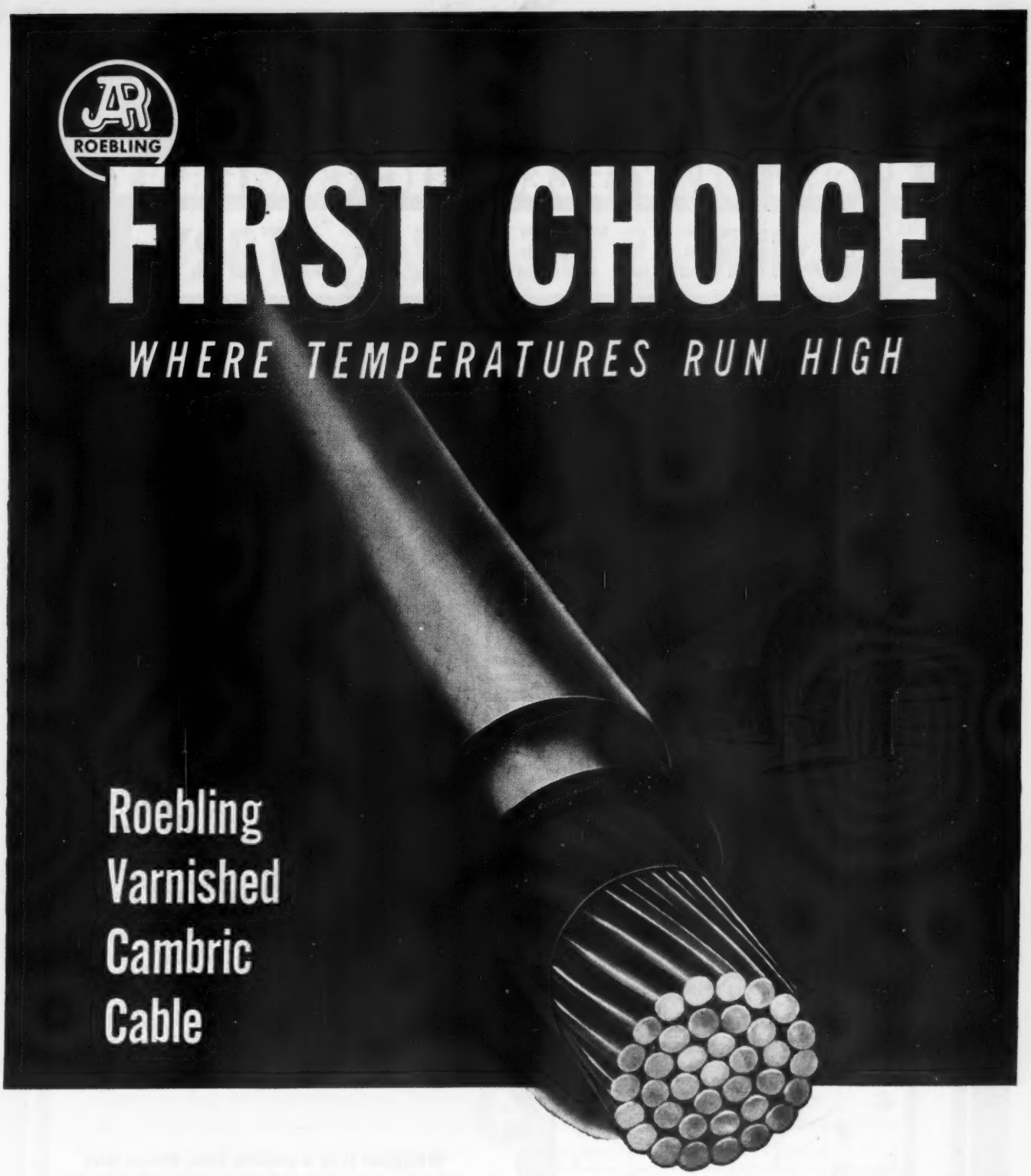
CONDUIT FITTINGS • CABLE TERMINATORS • CAST IRON BOXES
GROUNDING DEVICES • SOLDERLESS CONNECTORS • POWER CONNECTORS

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.
262 BOND STREET · BROOKLYN 2, N. Y.

ROEBLING

FIRST CHOICE

WHERE TEMPERATURES RUN HIGH



HEAT RESISTANCE YOU CAN COUNT ON

FOR TOPFLIGHT DEPENDABILITY where heat is a hazard, turn to Roebling Varnished Cambric Cable! You'll find it far superior to rubber-insulated cables for motor and generator leads and it is outstandingly adapted for transformer and oil switch leads.

Roebling Varnished Cambric Cable comes in single and multiple conductor types—single, from 2,000,000 C. M. to No. 14 A.W.G. Designed for use up to 17,000 volts between phases for unshielded multiple conductor . . . up to 21,000 volts between phases for single conductor and shielded cables on ungrounded neutral systems . . . up to 28,000 volts between phases for single conductor and shielded cables on grounded neutral systems.

Write for full information, or get in touch with your Roebling Distributor who will gladly help. John A. Roebling's Sons Company, Trenton 2, N. J.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ ***Boston,*** 51 Sleeper St. ★ ***Chicago,*** 5525 W. Roosevelt Rd. ★ ***Cleveland,*** 701 St. Clair Ave., N. E. ★ ***Denver,*** 1635 17th St. ★ ***Houston,*** 6216 Navigation Blvd. ★ ***Los Angeles,*** 216 S. Alameda St. ★ ***New York,*** 19 Rector St. ★ ***Philadelphia,*** 12 S. 12th St. ★ ***Pittsburgh,*** 855 W. North Ave. ★ ***Portland, Ore.,*** 1032 N. W. 14th Ave. ★ ***San Francisco,*** 1740 17th St. ★ ***Seattle,*** 900 First Ave.

ROEBLING

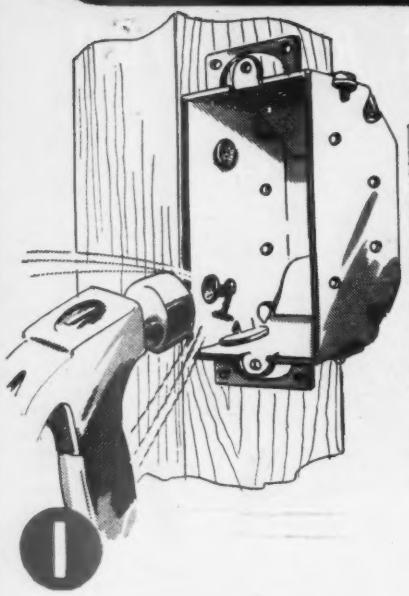
☆ *A CENTURY OF CONFIDENCE* ☆

TO HELP ELECTRICIANS DO *Better* WORK *Quicker*
HAS ALWAYS BEEN THE AIM *of*

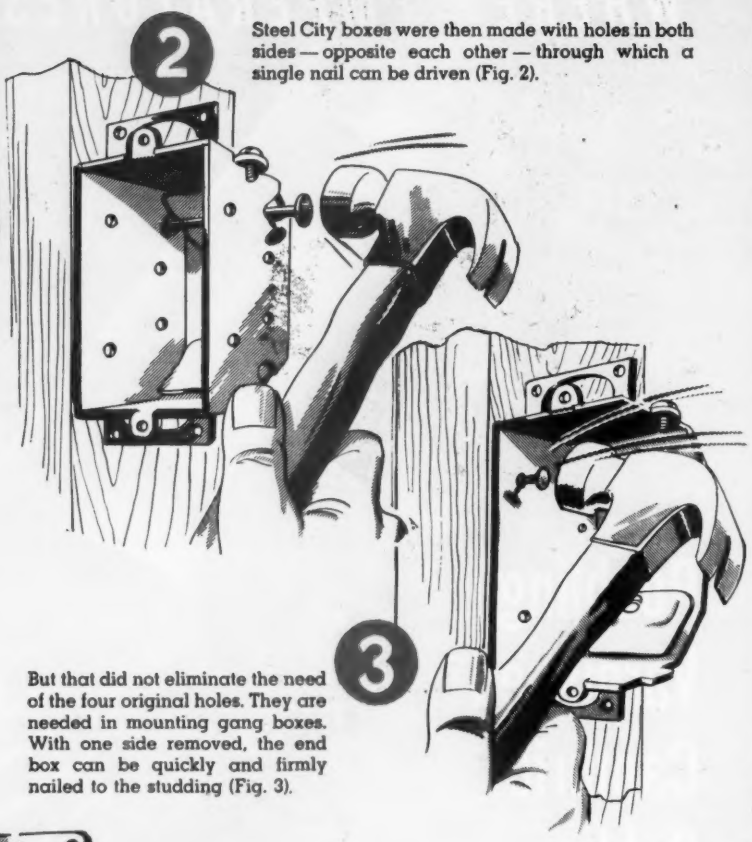
STEEL CITY ELECTRIC COMPANY

FOR INSTANCE

HERE IS THE "*HOLE*" STORY

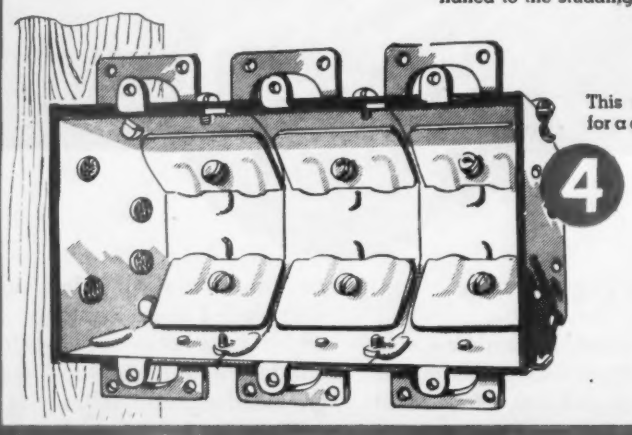


The ordinary switch box had four holes in the side for mounting on studding. While one side could be removed from Steel City Sectional boxes to facilitate driving the nails, to save time it was usually toe-nailed (Fig. 1), often resulting in a poor job.



Steel City boxes were then made with holes in both sides — opposite each other — through which a single nail can be driven (Fig. 2).

But that did not eliminate the need of the four original holes. They are needed in mounting gang boxes. With one side removed, the end box can be quickly and firmly nailed to the studding (Fig. 3).



This affords a firm foundation for a gang of any number (Fig. 4).

Whether it is a switch box, outlet box or cover, a floor box, junction box or conduit fitting, if it's a STEEL CITY, it will be designed to do a better job quicker and with greater ease.

Steel City leads in meeting your needs

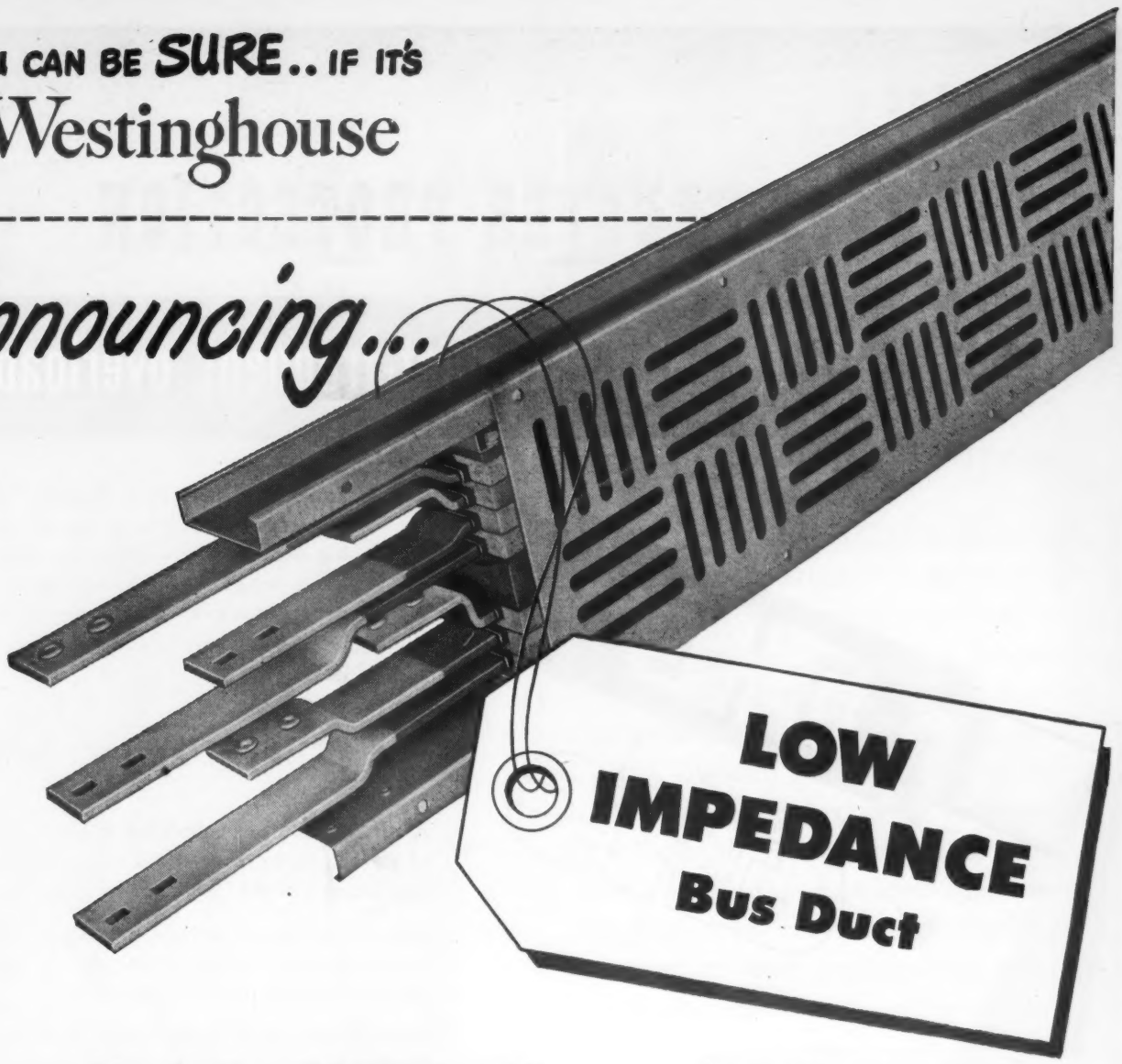
STEEL CITY ELECTRIC COMPANY

1207 COLUMBUS AVENUE, PITTSBURGH (12), PENNA.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Announcing...



. . . for better "long haul" power distribution

Now you can lick the problem of excessive voltage drop in long feeder runs. New, Westinghouse Low Impedance Bus Duct is the equipment you need.

Close spacing and interlacing of busbars in low impedance duct assure *low* voltage drop . . . actually about one-half of that for conventional plug-in or feeder duct. This permits more efficient operation of electrical equipment served by long feeder runs.

Low impedance duct safely withstands high short-circuit stresses and is economical on high-capacity circuits. Its steel housing is *small* to conserve space . . . *ventilated* to decrease temperature rise . . . *Bonderized* to prevent rust and corrosion.

Don't gamble with a crippling low-voltage condition. Be *sure* with Low Impedance Bus Duct!

For full details write Westinghouse Electric Corporation, P.O.Box 868, Pittsburgh 30, Pa.

J-30002

Westinghouse Bus Duct

GREATER PROTECTION

Against most-frequent overloads

Economy "Time-Delay" Renewal Links allow maximum blowing time on starting and overloads within the 135% to 200% range where most overloads occur, thus preventing unnecessary blows and costly stoppages.

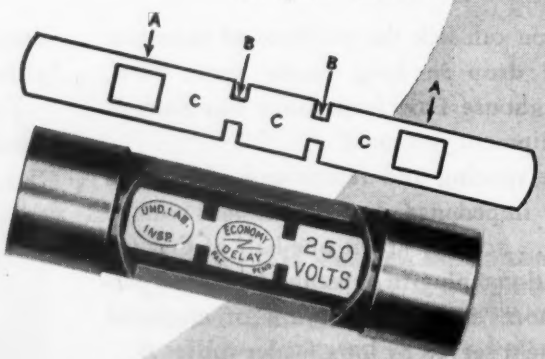
How "TIME-DELAY" Links Operate

Areas A and B are calibrated to control flow of current, so as to meet the maximum of all requirements of the "Standard for Fuses".

Area A consists of sections or bridges which control flow of current to sections C, which absorb heat and result in time delay.

Area C consists of heavy cross section zinc to absorb excess current, allowing maximum blowing time on starting loads and overloads.

See your Electrical Wholesaler.



ECONOMY DE-LAY RENEWABLE CARTRIDGE FUSES

SEND FOR NEW CATALOG

9329

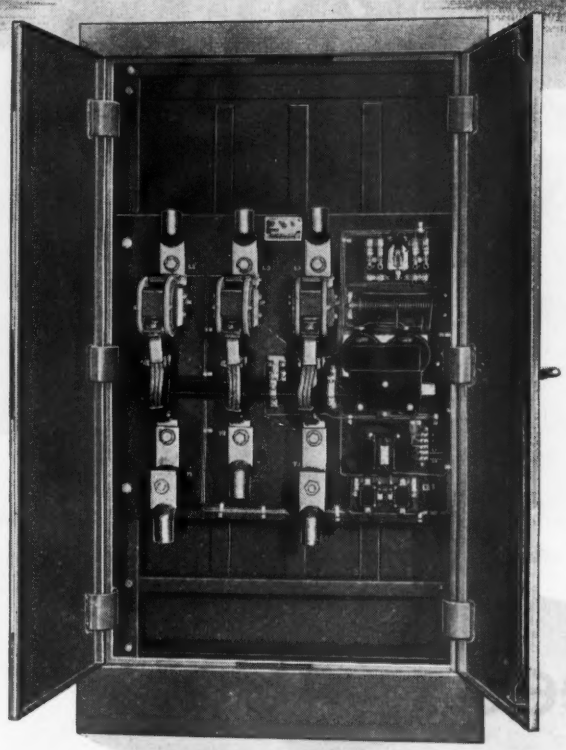
ECONOMY FUSE AND MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILLINOIS REPRESENTATIVES IN ALL PRINCIPAL CITIES

This NEW

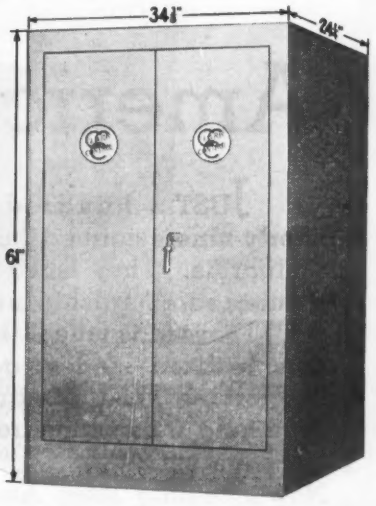
CLARK ACROSS-THE-LINE MAGNETIC STARTER

BULLETIN 6013
Size 6

has THERMAL OVERLOAD RELAY
Using Interchangeable Heaters



In this re-designed CLARK Bulletin 6013 Size 6 Starter, the magnetic overload relay formerly used, which required factory pre-setting to specific motor characteristics, has been replaced with the well-known CLARK Bulletin 7322 Thermal Overload Relay—which can be adapted to various HP ratings in the field by simply changing standard heaters. "Do-Nut" type current transformers mounted on load terminals are used to reduce current in the relay circuit.



Starter consists of sturdy Bulletin 7700 Contactor with rectifier-operated DC magnet, Overload Relay, and Control-Circuit Transformer, if voltage is over 110. Apparatus is mounted on a slate panel and enclosed in attractive NEMA Type 1 cabinet. Other type cabinets are available—all with plenty of wiring space top and bottom. Front-wired for accessibility.

This new design is also available in the CLARK Bulletin 6018 Combination Starter, and 6030 Reversing Starter.

Available through your CLARK Distributor

THE CLARK CONTROLLER CO.

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

America Needs '49ers

JUST a hundred years ago, the Forty-niners stormed the gold fields of California. They faced staggering obstacles, sure hardship, uncertain reward. Thousands failed, thousands of others realized modest gain, a few made fortunes. None sought or received help or direction from a benevolent government.

Now a century later, America faces another age of golden opportunity--an era when science and industry reveal new treasure to be had for the making. Turning today's visions into reality calls for '49ers--men of purpose and resolution, courage and independent spirit. You as a leader in your community may find a personal challenge and an inspiration in the Old '49er. By example and precept, you can help America toward her greatest accomplishments--in prosperity and peace.

The Youngstown Sheet and Tube Company

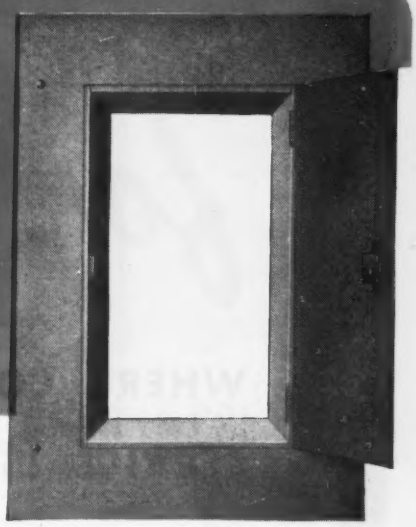
General Offices -- Youngstown 1, Ohio

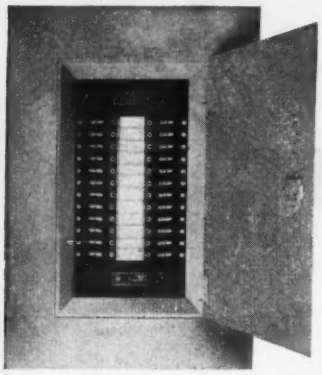
Export Offices--500 Fifth Avenue, New York

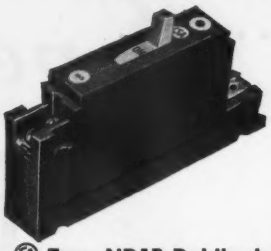
MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

Put Long-lasting *Performance* into your lighting panel







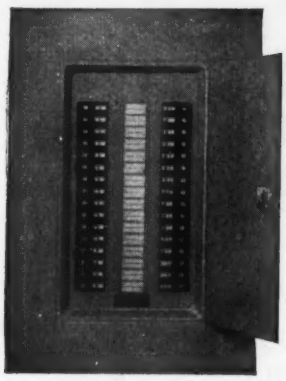
Ⓕ Type ND1B Dublbrak Circuit Breaker Panelboards combine the finest features of automatic *thermal* trip with quick-acting, double make and break connections. Individual, heavy-duty type circuit breakers provide automatic protection against overload or short circuits. Standard or narrow column types for easy installation . . . assembled to fill individual needs with long, trouble-free service.

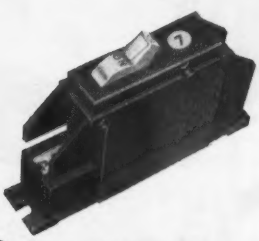
Capacities: 15 to 50 amperes, 4 to 42 branch circuits, 125 volts AC or DC, 3 or 4 wire solid neutral mains.

The value of any panelboard lies within! Make certain you buy long-lasting, trouble-free performance for lighting branch circuit service.

Whatever your preference—circuit breakers or switch and fuse . . . whatever your needs . . . few or many . . . Ⓕ Panelboards are *standardized* in design, but tailored for your particular installation.

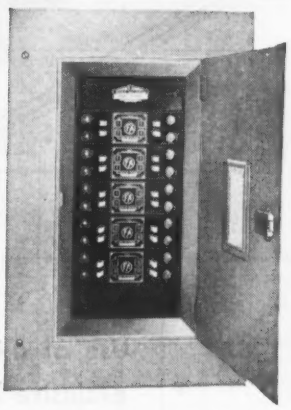
Shown here are but three Ⓕ Panelboards . . . all Underwriters' Laboratories, Inc., approved . . . any one of which will fill your panelboard needs . . . all of which will supply the dependable, long-lasting performance you want.





Ⓕ Type NAC1B Thermag Circuit Breaker Panelboards are tailored to fit your needs. The *thermal-magnetic* action of the individual circuit breakers provides time-lag characteristics on momentary, harmless overload, and instant and automatic protection against short circuits or dangerous overloads . . . in hotels, stores, institutions, and public buildings. These *fuseless* panelboards are available in a variety of sizes . . . furnished in standard or narrow column types . . . and built for long-lasting performance.

Capacities: 15 to 50 amperes, 120 volts AC only—4 to 42 branch circuits with 3 or 4 wire solid neutral mains.



Ⓕ LNT1P Safety-type Panelboards combine single pole, heavy-duty tumbler switch and plug fuse into a four circuit standardized section. The Ⓕ Tumbler Switches are of quick-make, quick-break type with double break contacts. All parts, including switches, are applied from rear, providing safety under all operating conditions . . . year after year. The Ⓕ LNT1P Panelboard is excellent for practically any industrial or commercial installation requiring panelboards for centralized switching control.

Capacities: 30 amperes, 250 volts, 4 to 42 branches, for 3 or 4 wire solid neutral mains.

Ask for Bulletin 301

FA TRADE MARK

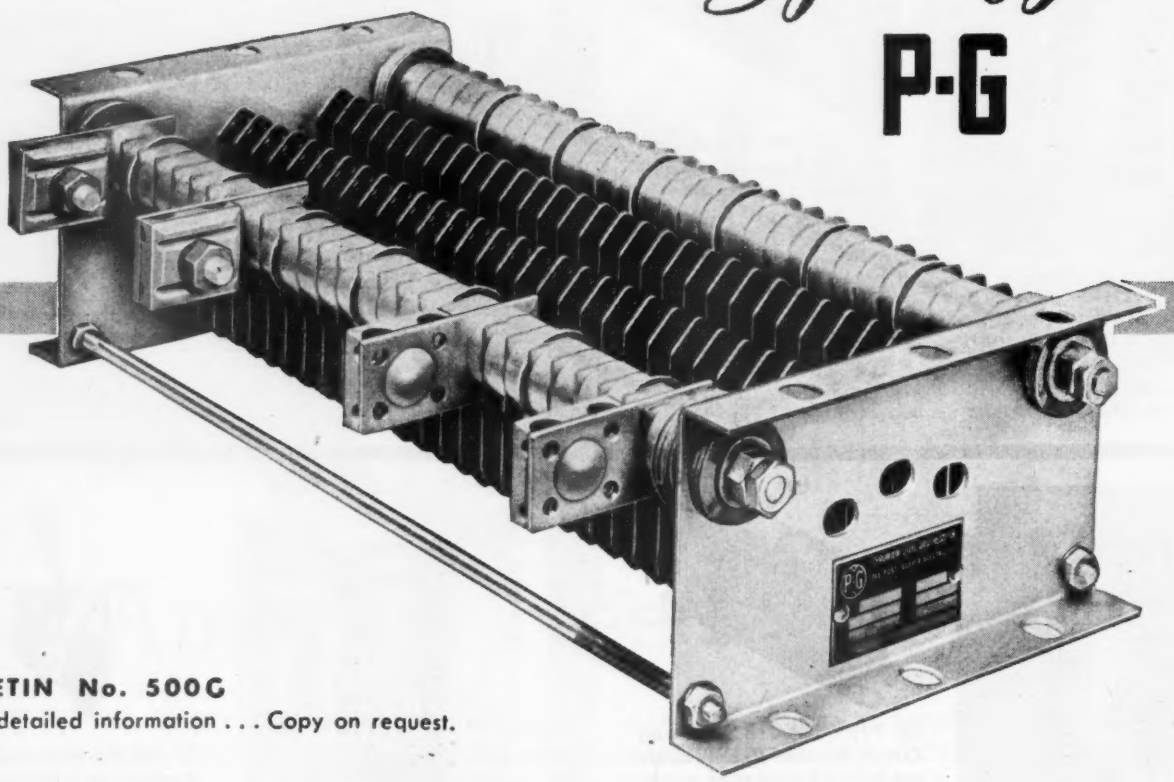
Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

for any job...

WHERE CONSTANT "TROUBLE-FREE" RESISTOR SERVICE IS ESSENTIAL..... *Specify* **P-G**



BULLETIN No. 500G
Gives detailed information . . . Copy on request.

Use of alloy steel and mica insulation, coupled with exclusive features of design, make P-G Resistors capable of constant "trouble-free" service. Specify P-G for maximum production with minimum maintenance.

P-G

The Nonbreakable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

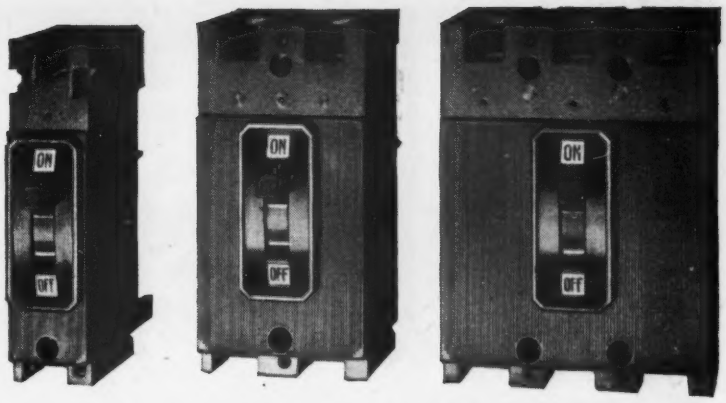
It's simple addition:

Their
GREATER
DURABILITY

\+ HIGHER
EFFICIENCY

\+ INCREASED
ACCURACY

= GREATER
DEPENDABILITY
for your
panelboards!



I-T-E TYPE ET THERMAL CIRCUIT BREAKERS

APPROVED BY UNDERWRITERS' LABORATORIES

All panelboard circuit breakers may look alike, but only the I-T-E Type ET breakers offer you the durability of more rugged construction, the efficiency of better-designed contact mechanism, and the accuracy of minimized derating factors. Only I-T-E circuit breakers are designed and built by *Switchgear Specialists!*

Consider the construction: All metal parts are heavier, stronger. They stand up better under constant use — last longer under heavy duty.

Note the contact operation: Contact pressures average 25% higher than those of other makes of thermal breakers. I-T-E Type ET contacts have less tendency to oxidize; contact temperature and resistance is kept to a minimum — contact efficiency is higher.

Compare the accuracy: Type ET Thermal elements operate with high temperature use — derating factors are kept to an absolute minimum.

Next time you need a panelboard, remember these three points — they add up to more dependable protection for your distribution system.

➡ *Complete information on I-T-E Type ET thermal breakers is contained in catalog 5003. Send for it today. I-T-E will be glad to supply you with the names of panelboard builders in your locality who will furnish panelboards equipped with I-T-E Type ET circuit breakers.*

FEATURES OF I-T-E TYPE ET THERMAL BREAKERS ➡

TYPE CIRCUIT BREAKER	AMPERE RATINGS	VOLTAGE RATINGS AC	VOLTAGE RATINGS DC	UNDERWRITERS' LABORATORIES INTERRUPTING RATINGS AC	UNDERWRITERS' LABORATORIES INTERRUPTING RATINGS DC	NEMA INTERRUPTING RATINGS AC	NEMA INTERRUPTING RATINGS DC	STANDARD FEATURES: QUICK MAKE QUICK BREAK MECHANISM	STANDARD FEATURES: TYPE OF TRIP: THERMAL ONLY	STANDARD FEATURES: TYPE OF TRIP: THERMAL AND NON-ADJUSTABLE MAGNETIC	STANDARD FEATURES: TYPE OF TRIP: NON-ADJUSTABLE MAGNETIC	STANDARD FEATURES: TYPE OF TRIP: ADJUSTABLE MAGNETIC	STANDARD FEATURES: NON-INTERCHANGEABLE TRIP UNIT	STANDARD FEATURES: INTERCHANGEABLE TRIP UNIT	SPECIAL FEATURES: NON-AUTOMATIC	SPECIAL FEATURES: THERMAL AND ADJUSTABLE MAGNETIC TRIP	SPECIAL FEATURES: AUXILIARY SWITCHES	SPECIAL FEATURES: ALARM SWITCHES	SPECIAL FEATURES: SHUNT TRIP	SPECIAL FEATURES: UNDERVOLTAGE TRIP	SPECIAL FEATURES: MECHANICAL INTERLOCK	SPECIAL FEATURES: CENTER TAPPED STUDS	SPECIAL FEATURES: DRAWOUT STUDS
PANELBOARD AND INDIVIDUAL MOUNTING 1, 2 & 3 POLE	10-50	(1 POLE) 125 (2 & 3 POLE) 250	(1 POLE) 125 (2 & 3 POLE) 125/250	5,000	5,000	5,000	5,000	●	●				●		●									
100 AMP. FRAME NON-INTERCHANGEABLE TRIP 2 & 3 POLE	10-100	250 600	125/250 250	5,000 10,000	5,000 10,000	5,000 15,000	5,000 10,000	●		●		●	●		●	●	●	●	●	●	●	●	●	●
100 AMP. FRAME INTERCHANGEABLE TRIP 2 & 3 POLE	50-100	250 600	125/250 250			5,000 15,000	5,000 10,000	●		●				●	●	●	●	●	●	●	●	●	●	●
225 AMP. FRAME 2 & 3 POLE	70-225	250 600	125/250 250	10,000	10,000	15,000	10,000	●		●	●			●	●		●	●	●	●	●	●	●	●
600 AMP FRAME 2 & 3 POLE	125-600	250 600	125/250 250	10,000	10,000	25,000	20,000	●		●	●			●	●		●	●	●	●	●			●

I-T-E THERMAL CIRCUIT BREAKERS

The Center of Switchgear Progress

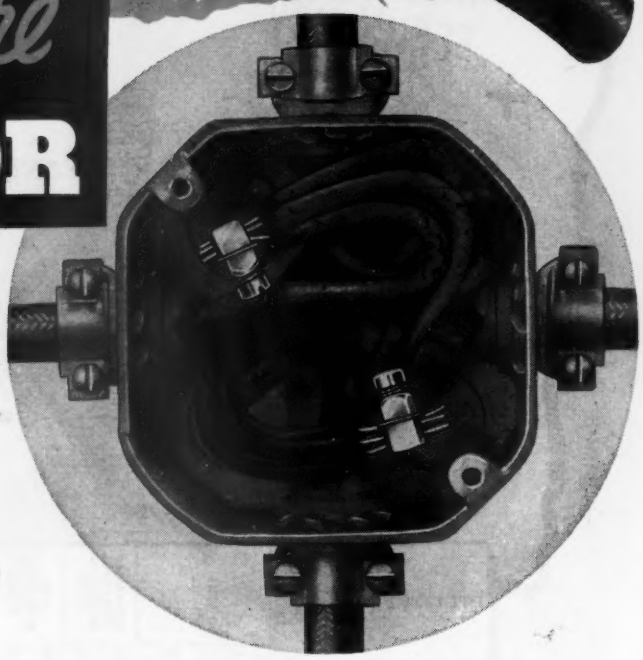
I-T-E CIRCUIT BREAKER COMPANY, 19th & HAMILTON STREETS, PHILADELPHIA 30, PA.
31 OFFICES IN UNITED STATES • In Canada, EASTERN POWER DEVICES, Ltd., TORONTO

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • AUTOMATIC RECLOSING CIRCUIT BREAKERS • RESISTORS • SPECIAL PRODUCTS

No Need to Clip Pigtails!

with this Amazing New

BLACKBURN *Building Wire* CONNECTOR



This efficient new BLACKBURN Connector is ideal for motor leads and junction boxes, because connections may be changed without clipping off the old pigtails. You simply remove the connector and rearrange the wires.

The BLACKBURN Building Wire Connector costs as little as 5c. It's an efficient, tried-and-proved connector for any inside use. Three sizes cover a range from #14 to #4. Self-contained washer prevents set screw from cutting into wires.

This new connector is easy and quick to install, and easy to remove for re-connections or wire changes. It's small, compact, and easy to tape. Economical too—because it saves the labor of soldering.

SEND FOR FREE SAMPLES, OR ORDER FROM YOUR JOBBER, TODAY

Catalog Number	Wire Sizes		Standard Package	Shipping Weight per 100
	Minimum	Maximum		
10 U	2 #14	4 #14 3 #12 2 #10	100	1 lb.
6 U	2 #8	3 #8 2 #6	100	2 lbs.
4 U	2 #6	2 #4	100	3 lbs.

Costs as little as 5¢!

FULLY APPROVED BY UNDERWRITERS' LABORATORIES!

Many Uses:

In Junction Boxes
For Connecting Motor Leads
For Connecting Light Fixtures
For Connecting Electric Ranges
For Any Indoor Wiring

3 Sizes Cover Range From #14 to #4

FIRST, MADISON & CLINTON STS. • **JASPER BLACKBURN PRODUCTS CORP.** • ST. LOUIS 6, MISSOURI

BUILDERS OF QUALITY PRODUCTS FOR 15 YEARS

A Typical Submarine Cable (Type 114-PP) Insulated with BAKELITE Polyethylene

Conductor— #8 A.W.G. Stranded

Insulation— Polyethylene 10/64" thick

Concentric conductor— serving of copper wires each .0285" diam.

Polyvinyl chloride plastic jacket— 5/64" thick

Rubber-filled tape

Jute serving

25 galv. steel armor wires— #12 B.W.G.

Jute serving— with tar under and over

DRY AS A BONE!

Here's news about submarine cables! In at least three important installations in different parts of the world—as in a number of laboratory tests—data have been provided which clearly back up predictions as to the overwhelming success of BAKELITE Polyethylene as insulating material for low voltage submarine cables for both salt and fresh water. Not only do conductors remain "dry as a bone," but service-life forecasts are astounding! Some cable has already seen five years' service under the English Channel.

As in other highly successful uses of this newest of the family of BAKELITE Plastics, the usefulness of BAKELITE Polyethylene is based on its unusual combination of properties. Among these are: **Low dielectric constant and power factor. Impact and abrasion resistance. Extremely low rate of water absorption. Inherent flexibility and extensibility over a wide range of temperatures. Light weight (lighter than water). Resistance to alkalies, chemicals, most strong acids. Resistance to water, sunlight, weather.**

Manufacturers and users, alike, are finding that BAKELITE Polyethylene insulation is providing longer, better service, often at lower cost, because of its extraordinary range of chemical, physical, and electrical properties. For complete technical data on BAKELITE Polyethylene—and on VINYLITE Brand Plastics—for insulating wire and cable of virtually every type, write Department GL-41.

Bakelite TRADE-MARK *Polyethylene* PLASTICS

BAKELITE CORPORATION

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

A Half-Century of Varnish Research

NOW BRINGS YOU

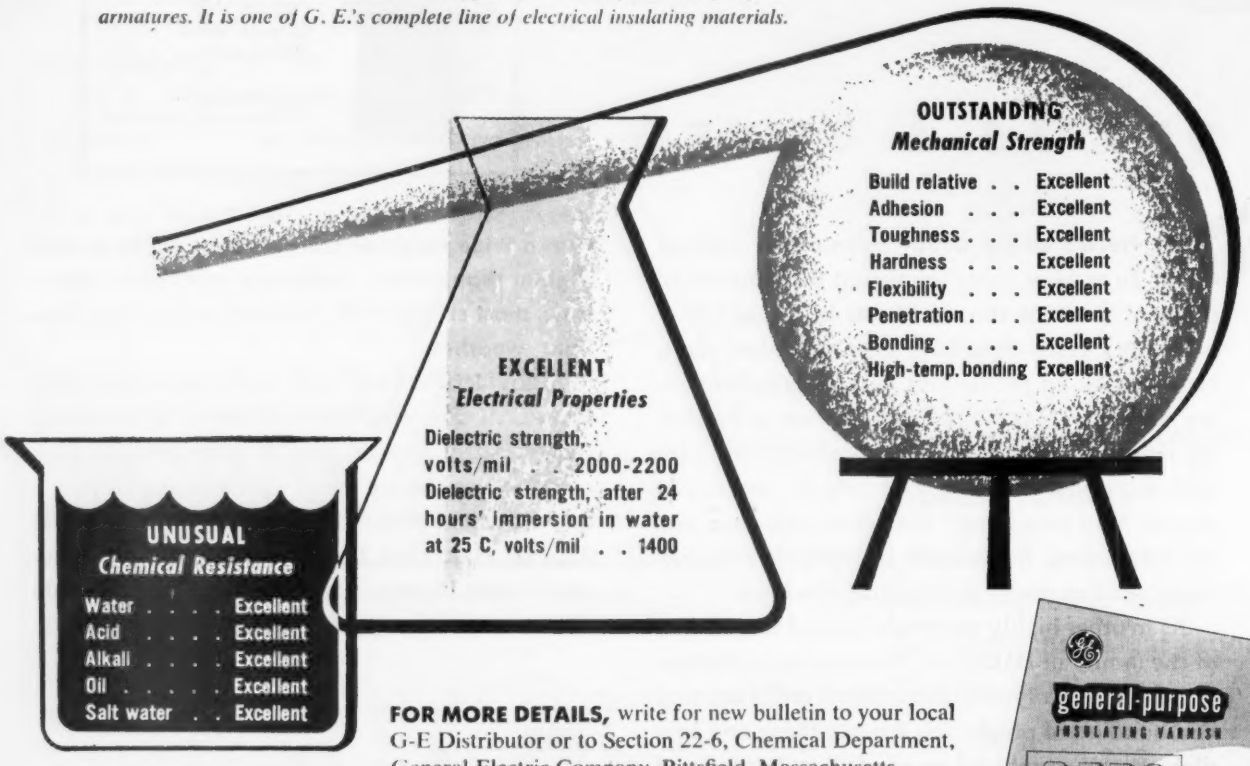
G-E'S NEW GENERAL-PURPOSE* INSULATING VARNISH—G-E 9574

Motor repair men and electrical equipment manufacturers will find it pays to investigate this new varnish. G-E 9574 represents the attainment of a long-sought goal—a varnish for *all* insulating purposes which combines in a single material the electrical, chemical, and mechanical qualities previously found at their best only in individual special-purpose varnishes.

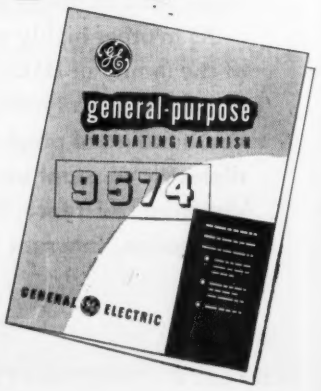
In addition, general-purpose varnish 9574 is *easy* to use. It is remarkably stable and does not tend to harden in the tank. It penetrates the deepest coils quickly and easily; bakes at low temperatures and can be used at barrel gravity or reduced with ordinary petroleum spirits for many applications.

Double-check these statements by the property tables below.

**G-E 9574 gives excellent results on all types of coils except extra-high-speed armatures. It is one of G. E.'s complete line of electrical insulating materials.*


OUTSTANDING
Mechanical Strength
Build relative . . Excellent
Adhesion . . . Excellent
Toughness . . . Excellent
Hardness . . . Excellent
Flexibility . . . Excellent
Penetration . . . Excellent
Bonding . . . . Excellent
High-temp. bonding Excellent
EXCELLENT
Electrical Properties
Dielectric strength, volts/mil . . 2000-2200
Dielectric strength, after 24 hours' immersion in water at 25 C, volts/mil . . 1400
UNUSUAL
Chemical Resistance
Water . . . . Excellent
Acid . . . . Excellent
Alkali . . . . Excellent
Oil . . . . . Excellent
Salt water . . Excellent

FOR MORE DETAILS, write for new bulletin to your local G-E Distributor or to Section 22-6, Chemical Department, General Electric Company, Pittsfield, Massachusetts.



You can put your confidence in—

GENERAL ELECTRIC

CD49-M5

Approved by UNDERWRITERS LABORATORIES

YES, the PENN-UNION Connector TAKES THEM ALL-

LARGER SURFACES for the WRENCHES ~ a good-sized HEX Top and Bottom

The men who use connectors appreciate the *better design* of the Penn-Union - - especially when they have to make a splice in close quarters, or any unhandy location.

Better Design is a feature of the entire Penn-Union line, which includes Tees and Taps, Straight Connectors, Terminals, Grounding Clamps, and many more fittings . . . every one thoroughly dependable, mechanically and electrically. *Preferred by leading users,* who have found that "Penn-Union" on a fitting is their best guarantee of unfailing service.

Far More in use than any other

Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd., 250 Richmond St. West, Toronto

The **Complete** *Line of Conductor Fittings*

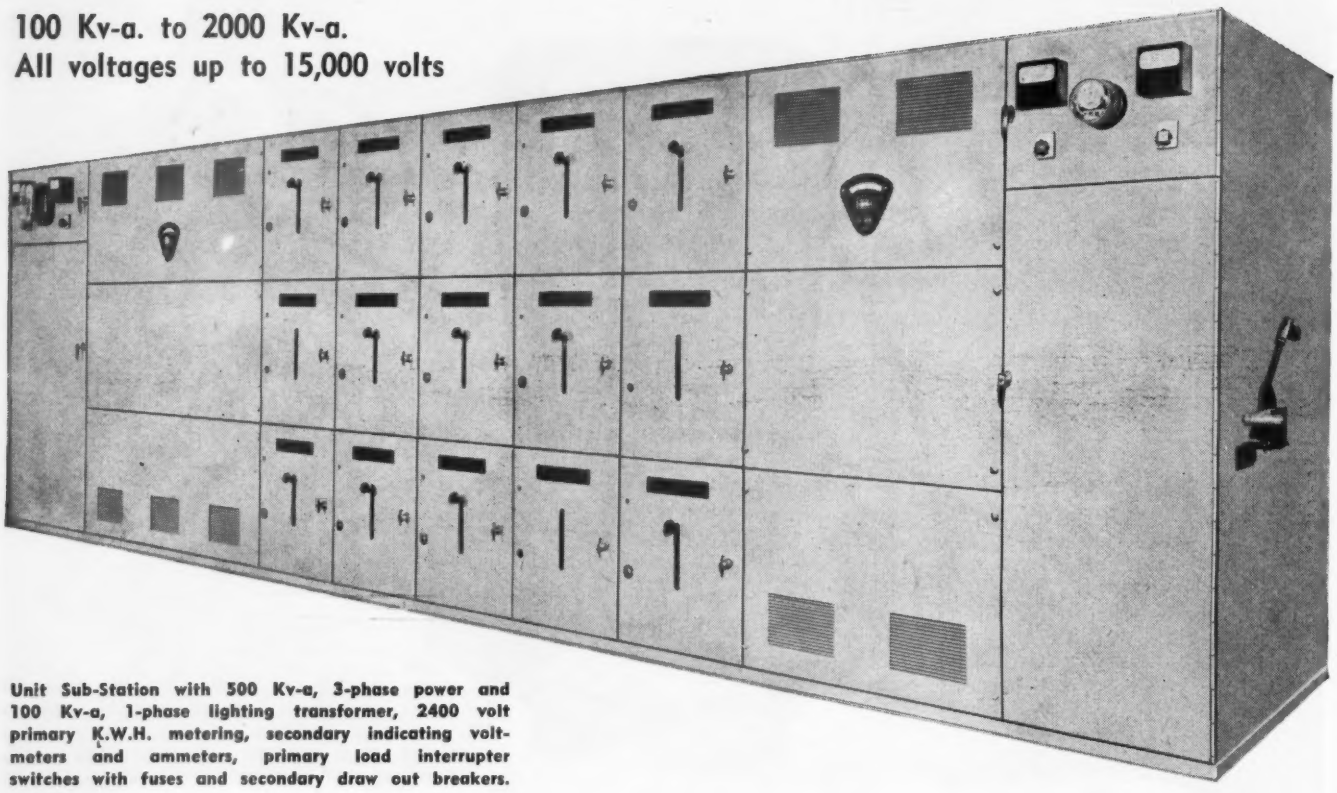
PENN-UNION

Modern Unit Sub-Stations

for Indoor Installation with

SORGEL Air-Cooled Transformers

100 Kv-a. to 2000 Kv-a.
All voltages up to 15,000 volts



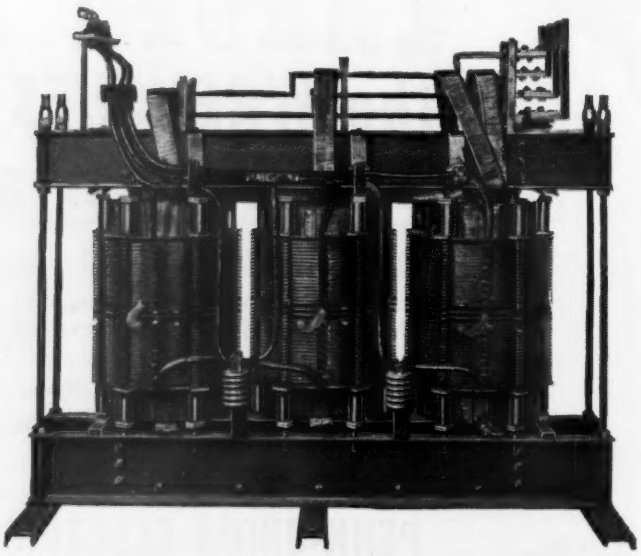
Unit Sub-Station with 500 Kv-a, 3-phase power and 100 Kv-a, 1-phase lighting transformer, 2400 volt primary K.W.H. metering, secondary indicating voltmeters and ammeters, primary load interrupter switches with fuses and secondary draw out breakers.

The complete unit sub-station is shipped in one or more factory-assembled units, completely wired, ready for installation and final connection. This eliminates the necessity for purchasing separately from various manufacturers the transformers, switches, fuses, insulators, circuit breakers and other accessories, and then assembling and connecting them on the job.

The entire sub-station, having all live parts enclosed, can be located in most any convenient place inside the building, without any other enclosure. Containing no oil, there is no need for a fireproof vault.

Maintenance expenses are reduced to a minimum, since there is no liquid to check, replenish or replace.

We also manufacture a complete line of General Purpose Air-Cooled Transformers. ¼ Kv.-a. to 2000 Kv-a. All voltages.



500 Kv-a, 3 phase, 13,800 volt Transformer with enclosure removed illustrates the disc type coil windings. This type of winding is employed for voltages above 5,000 volts. These disc type coils are separated from each other and supported with steatite ceramic insulators. All insulation is Class C and Class B throughout.

Sorgel Electric Co. *The* **PIONEERS** *in the development and manufacturing of Air-Cooled Transformers* **836 W. National Ave., Milwaukee 4, Wis.**

You can do a lot

with a little GOLD SEAL TAPE

That's one of the first things you notice about Gold Seal Tape—*it goes further.* There's more tape value in every roll because there's no waste.

Laboratory controlled production assures lasting "tack" in the friction compound. Gold Seal will not dry out or peel. Its top quality base cloth tears evenly, quickly, without raveling.

Hot or cold . . . rain or shine . . . here's a tape you can depend on to stick to the job—speed the work. Try Gold Seal—see why this "best buy in tape" is the lasting favorite of linemen and electricians.

In single rolls and handy ten-roll containers. Each roll is cellophane wrapped —*factory-fresh.* Jenkins Bros. (Rubber Division), 80 White St., New York 13.

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal Specifications.

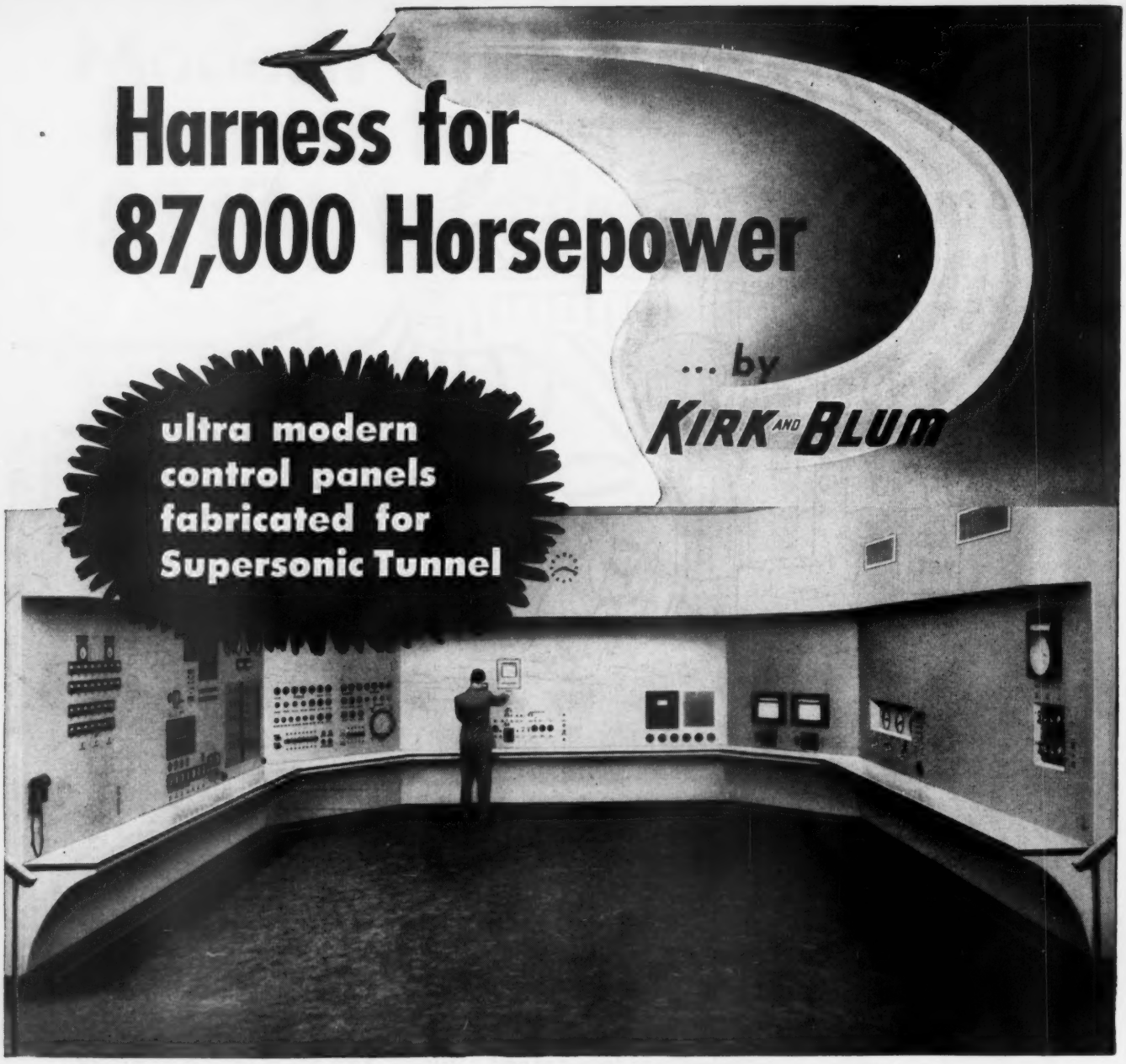
JENKINS Gold Seal Tapes

FRICTION and RUBBER TAPES

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

Harness for 87,000 Horsepower

... by KIRK AND BLUM



To simulate flight conditions up to 1500 miles per hour at altitudes near 35,000 feet is the job of this newest wind tunnel of the National Advisory Committee for Aeronautics, Lewis Flight Propulsion Laboratory at Cleveland, Ohio. Control for the giant 87,000 HP motor and its two-million cubic feet of air per minute compressor are centered on a control board fabricated by KIRK & BLUM.

The control panels are made of $\frac{1}{4}$ inch steel. The desks below are of 16 gauge steel with Formica tops. An inlaid rubber foot rest is provided below the desks.

This is another example of the many types of electrical enclosures built by KIRK & BLUM for Industry, Power Plant, Utilities and other users.

Large or small units . . . one or a thousand . . . that's the range of KIRK & BLUM facilities, backed by over 40 years of experience.

Write for Booklet "Sheet Metal Assemblies", showing the complete list of equipment and facilities KIRK & BLUM has available to produce your product.

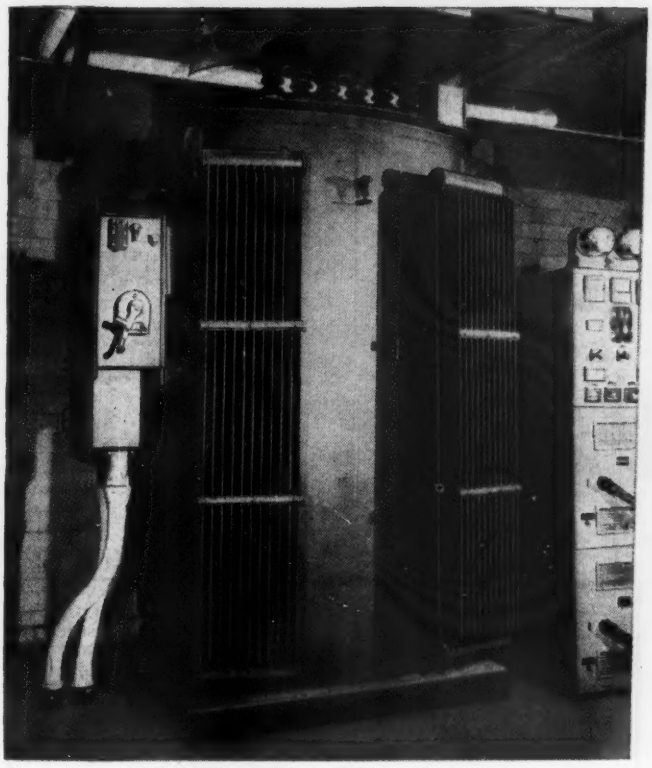
KIRK AND BLUM

The KIRK & BLUM MANUFACTURING CO.
2903 Spring Grove Ave., Cincinnati 25, Ohio

• Control Desks and Panels • Switch Gear Housings • Instrument Panels • Cubicles • Transformer Housings and Tanks • Electrical Enclosures • Machine Bases • Ventilating Louvres

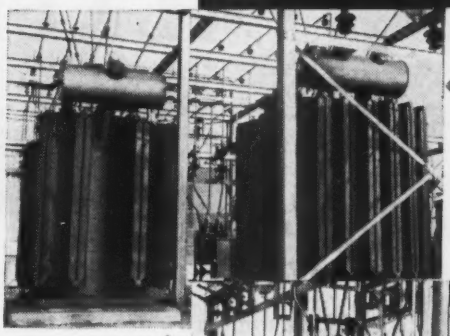
ALLIS-CHALMERS Transformers Supply Needed Power

AS "LUSTRON" SETS UP TO BUILD 45,000 HOMES A YEAR



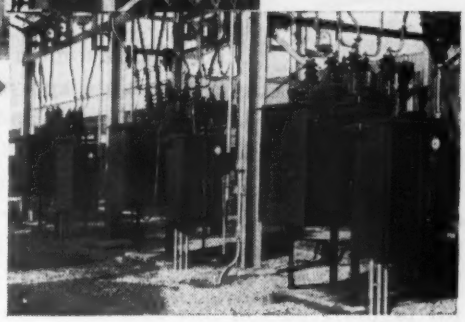
One of eleven 1500 kva *Chlorextol***-Liquid* cooled transformers which supply power for presses and other equipment used in making porcelain enameled steel surfaces.

"Tomorrow's Home Today" is the theme of Lustron's modern volume produced metal home. Porcelain enameled wall panels are formed in giant presses, powered by Allis-Chalmers Transformers.



Rated 3000, and 15,000 kva, these two Allis-Chalmers power transformers step down transmission voltage in the plant's recently completed outdoor substation.

Allis-Chalmers oil circuit breakers, equipped with *Ruptor* interrupting devices, protect Lustron's electrical system. They incorporate quick-clearing, non-oil-throwing design.



13 Power Transformers Totaling Over 35,000 KVA Power Huge Presses, Electric Furnaces, Other Equipment at Modern Lustron Plant

IN HOME-BUILDING, metal-working, transportation, paper products, foods — in every major industry — Allis-Chalmers transformers are at work providing dependable power distribution.

Whatever *your* industry, whatever your type or size of plant, it will pay you to check into the features of A-C quality transformers. There's an Allis-Chalmers transformer for practically every basic power need. Call your nearby A-C sales representative, or write direct, stating type of application.

A 2681

ALLIS-CHALMERS, 930A SO. 70 ST.
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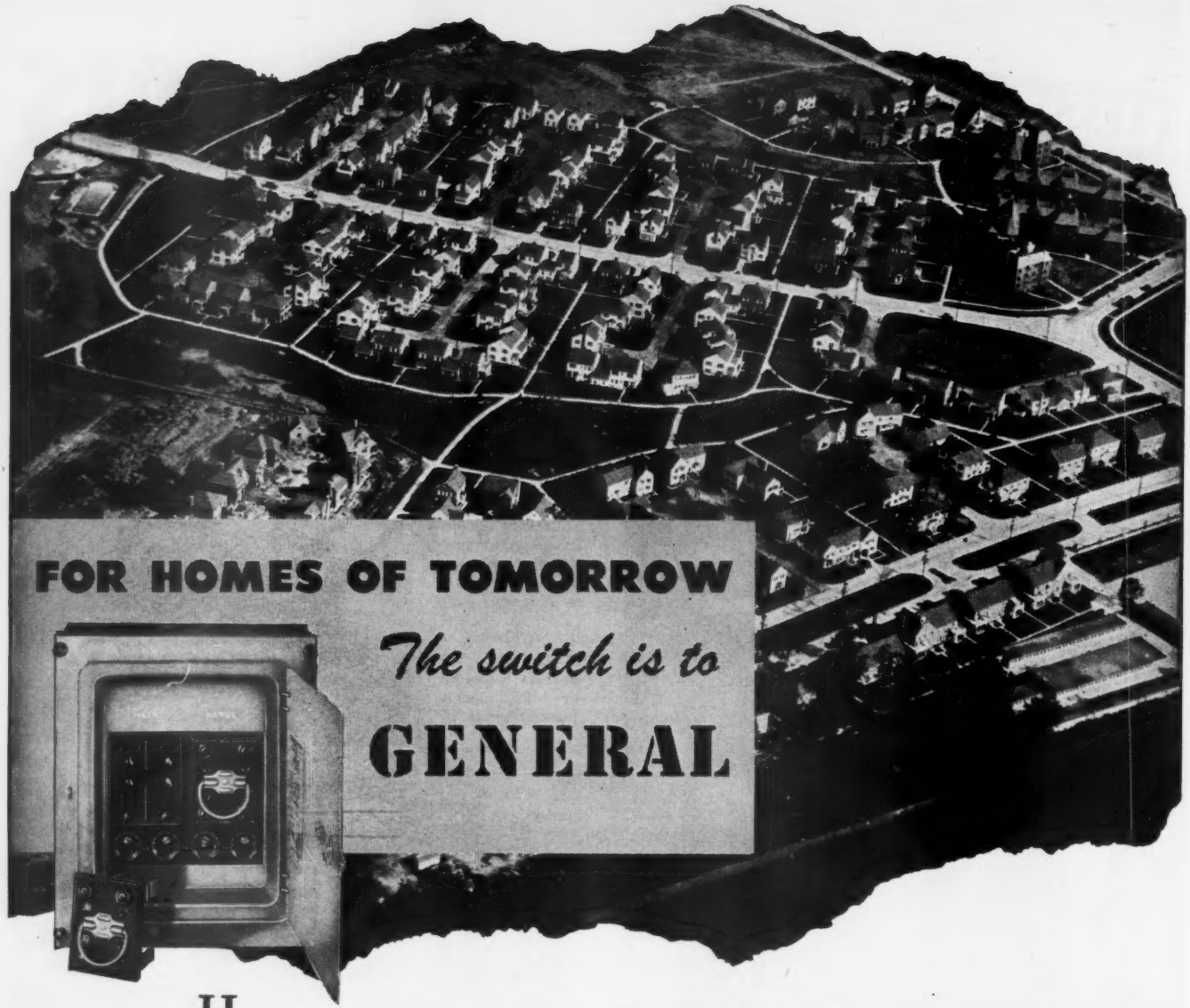
*Allis-Chalmers Fireproof Insulating Liquid. *Chlorextol* and *Ruptor* are Allis-Chalmers Trademarks.

ALLIS-CHALMERS

Pioneers in Power and Electrical Equipment from Generation through Utilization



FOR HOMES OF TOMORROW

The switch is to

GENERAL

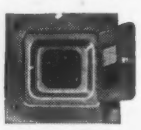
HOMES of tomorrow demand the best of today! That's why more and more electrical contractors—builders—architects—and wholesalers are switching to GENERAL!

GENERAL SWITCH CORP. specializes in the construction of Safety Switches, Service Entrance Equipment, Branch-Circuit or Residence Panels, Panelboards for Light and Power Distribution . . . for luxury type and low-cost housing projects. Safety Switches available from 30 through 1200 AMP.—250 V. and 600 V.—Type A, C and D—indoor and outdoor—horsepower rated.

Wherever quality—safety—convenience—endurance—trouble-free performance—ease of installation—and low maintenance costs are the first consideration, *the switch is to* GENERAL!

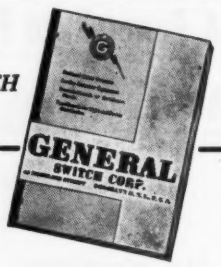
GENERAL MAIN AND RANGE COMBINATION. (Cat. No. 6214, surface or flush.) The most economical switch for range installations. Double pullout switch with one 60 AMP main and one 60 AMP range switch in series (also parallel). 4 lighting circuits (6 and 8 also available). Has 60 AMP sub-feed pressure wire connectors for water heater or other 220 V. circuits.

GENERAL EXTERNALLY OPERATED SAFETY SWITCH. (Cat. No. 1003N.) 100 AMP., 3 pole, 2 fuse switch with solid neutral. Knife blade construction. Plastic composition base. Quick-Break. Ample space for wiring.



GENERAL PLUG FUSE BRANCH-CIRCUIT or RESIDENCE PANEL. (Cat. No. 104, surface or flush.) Available up to 32 circuits. Flush spring catch.

Ask your wholesaler or write today for the GENERAL SWITCH 68-page catalog.



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Wire-Nuts* PATENT No. 1,933,555 UPHELD

Another Judgment Against Infringers in U.S. Federal Court

Every "Wire-Nut" has the name "IDEAL" clearly molded on the end. Always insist on genuine IDEAL "Wire-Nuts" and be protected.

The spring insert in IDEAL "Wire-Nuts" automatically twists the wires together and holds them in a vise-like grip as the Connector is applied. The IDEAL connection is safe, vibration-proof and resists pull-out.

APPROVED — IDEAL "Wire-Nuts" are listed by Underwriters' Laboratories, Inc., and approved by other leading electrical authorities.

The validity of Patent No. 1,933,555 covering IDEAL Solderless, Tapeless Wire Connectors has been sustained by Court Decree. This was the judgment in a suit filed by IDEAL INDUSTRIES, Inc., against the ATLAS COMPANY of New York City, who were infringing the IDEAL Patent covering Wire Connectors of the coil spring type.

The judgment in favor of IDEAL INDUSTRIES, Inc., was entered April 18, 1949 by the United States District Court, South District of New York.

The only other spring insert type Wire Connectors sold under Patent No. 1,933,555 are marketed by: Bryant Electric Company, Bridgeport, Conn.; Solar Electric Corporation, Warren, Pa.; and Weiss & Biheller Merchandise Corporation, New York, N. Y.

It is IDEAL's intention to continue to protect this Patent by such legal action as may be necessary.

HIGH QUALITY PROTECTED

As manufacturers of "Wire-Nuts" (the original Solderless, Tapeless Wire Connectors), IDEAL INDUSTRIES, Inc., has for many years relentlessly endeavored to protect the best interests of the electrical industry by insisting on high quality.

Only highest quality materials are used in the manufacture of IDEAL "Wire-Nuts". They are made to strictest precision tolerances and each Connector is individually inspected. The dependability of "Wire-Nuts" is proved through many years' application in all types of electrical wiring—from 3 No. 10 up to 2 No. 18 solid and/or stranded wires. *Many millions in use!*

IDEAL "WIRE-NUTS" ARE DISTRIBUTED BY AMERICA'S LEADING WHOLESALERS

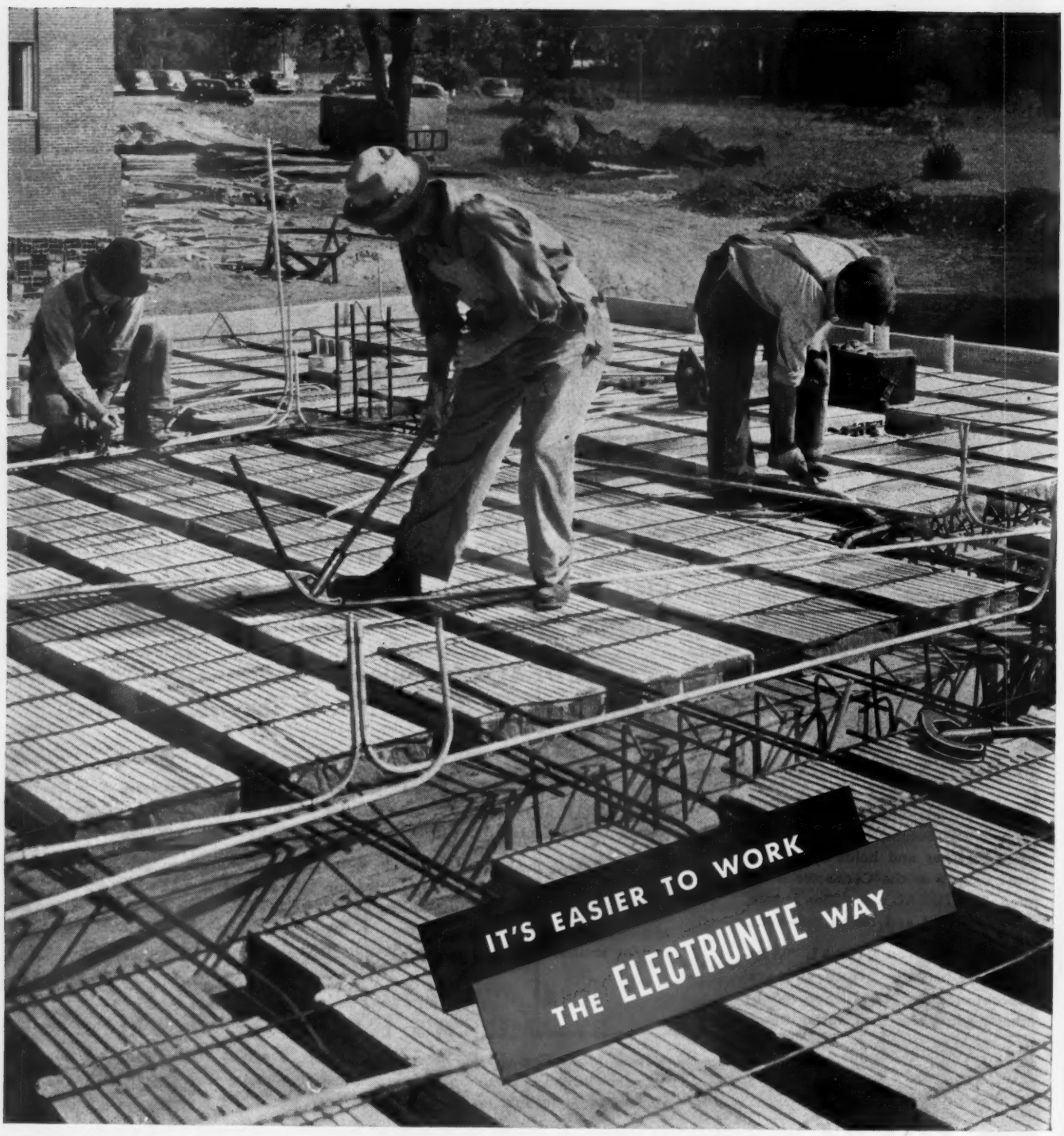
*Trade-Mark Reg. U. S. Patent Office (No. 424,062). Only IDEAL Solderless, Tapeless Wire Connectors are packaged in yellow metal edge cartons and carry this trade-mark identification.

IDEAL

IDEAL INDUSTRIES, Inc. Sycamore, Illinois

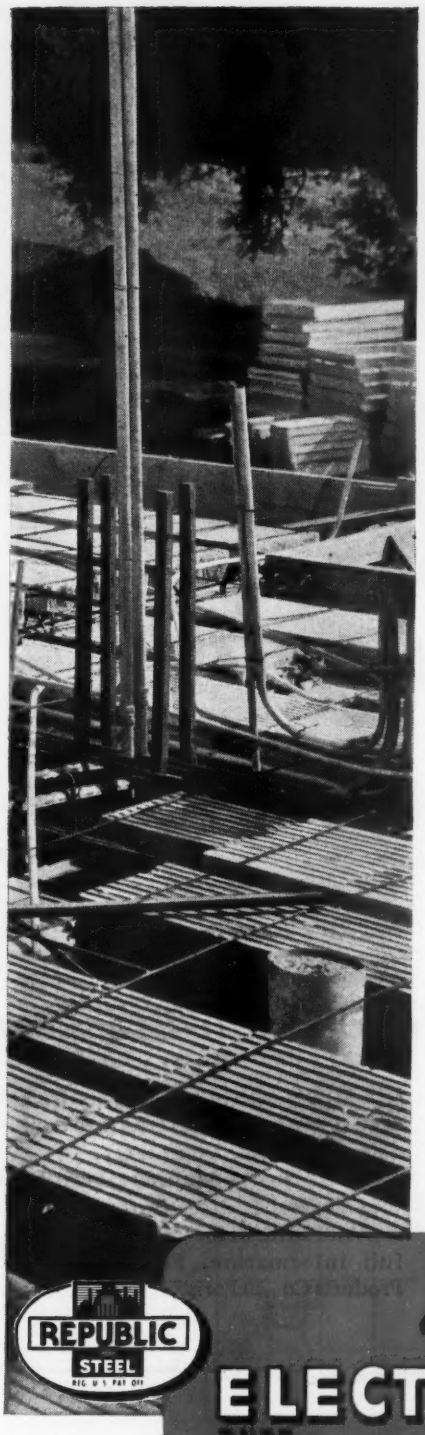
ELECTRUNITE

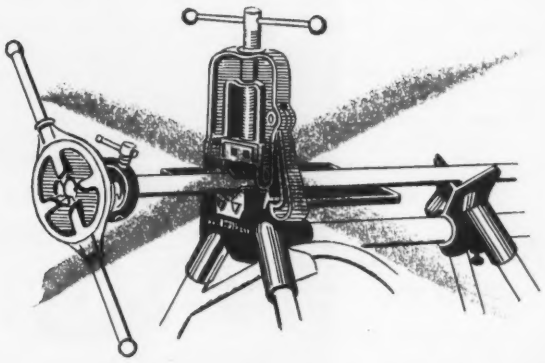
PROVIDES RIGID STEEL PROTECTION



—THE *Original* E.M.T.

WITHOUT THREAD-CUTTING PROBLEMS





● There's no need for pipe vise, thread chasers or other "plumbing" tools, when your men use Republic ELECTRUNITE E.M.T.—the *electrician's* raceway for modern, dependable wiring protection.

Because ELECTRUNITE E.M.T. is *threadless,* it's ready to use when it arrives on the job . . . one minute with a hacksaw, and cut lengths are ready to be installed. Strong, vibration-proof, compression couplings make water-tight joints in a matter of seconds . . . eliminate the need for turning long lengths of tubing into fittings.

With ELECTRUNITE E.M.T., that's only part of the story, too. Inch-Marking* and Knurled Inside Surfaces combine with light weight and simplified bending to make this the easiest-to-install rigid steel raceway in existence. For complete information about ELECTRUNITE E.M.T., see your nearest ELECTRUNITE Distributor, or write direct to:

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LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

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SAFETY! CONVENIENCE! FINGER TIP CONTROL! You get them *all* with Federal Noark Multi-Breakers . . . plus smartest modern appearance in both flush and surface mounting types.

When plans call for an electric range, water heater, household appliances and lighting circuits, turn to Federal Noark Multi-Breakers! As a 16-circuit load center or 2, 4 or 8-unit panel they are compact, versatile and *safe*. They provide manual disconnect . . . automatic overload protection for branch circuits... can be used as service entrance equipment.

Federal Noark Multi-Breakers come in Types M, MO, MO4, M1, M2, MB and MBM, with space capacity from 1 to 16 single poles (convertible to double pole with handle extensions).

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JUNE .... at a Glance

Industrial Construction

Electrical distribution systems are playing an ever-increasing role in industrial plant layout and design. They are closely tied in with production layouts, yet must be sufficiently flexible to allow for the constant change which has become normal in mass production operations. Hotpoint's new range plan in Chicago is the subject of our outstanding electrical construction feature this month. Here, radial-ring high voltage distribution provides for efficient distribution of energy. Automatic electric interlock control on production machines and the extensive conveyor system are important highlights of the electrical installation. Oscar Sweningson, President of Sweningson & Company, Chicago, tells the story of this installation, beginning on page 49.

Motor Shop Advertising

The sales problem of the modern motor shop is highly specific. The business is largely a service operation working in very close contact with its customers on a high level of professional and technical competence. As advertising is a part of the selling job, it, too, is different from other commercial advertising programs. To explore current practice, we surveyed a large segment of the membership of the National Industrial Service Association on their current advertising and sales promotion practices. Out of the generous response, we charted the most significant data and turned it over to Manager W. W. Garey, for his comments and the comments of other experienced advertising consultants. The proceeds formed the basis for a report presented by the authors to the National Industrial Service Association's Annual Meeting in St. Louis this month. It also appears here in the article, "How Motor Shops Sell," beginning on page 58.

Hazardous Area Signals

While signaling and communication systems do not handle large currents of the order of power and lighting systems, even the small currents involved can spark at switch points, armatures, loose connections or wiring failures. In hazardous areas, therefore, signaling and communication wiring and equipment must be considered in the light of explosion-resistant designs and installation practices. A. A. Schuhler, in continuing his series on signaling apparatus, explores this important field in "Signaling and Communication for Hazardous Locations," beginning on page 60.

Brilliance

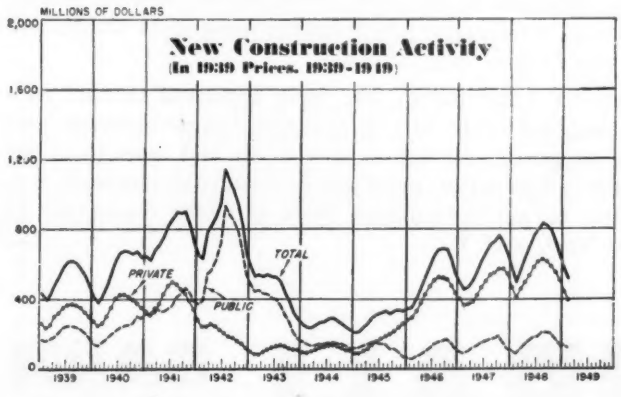
Jewelry stores have always presented special problems in the application of lighting. The lighting system must not only produce diffuse, soft, area lighting to give warmth and charm to the store, but sharp, point-source, direct lighting must be used to provide sparkle and brilliance in the appearance of the products displayed. Continuing his series, Berlon C. Cooper presents a round-up of lighting methods in "Jewelry Store Lighting Techniques" on page 62.

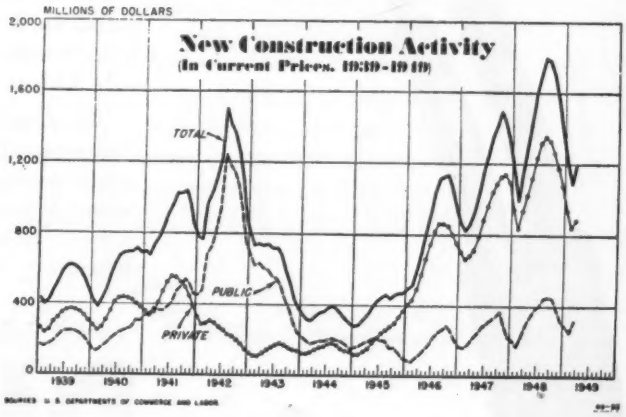
Wave-Wound Connections

Chelso Gentilini, Electrical Engineer of the National Electrical Coil Company, describes an ingenious and useful test light check method for checking wave wound rotor connections. The method is described and illustrated in his article beginning on page 65.

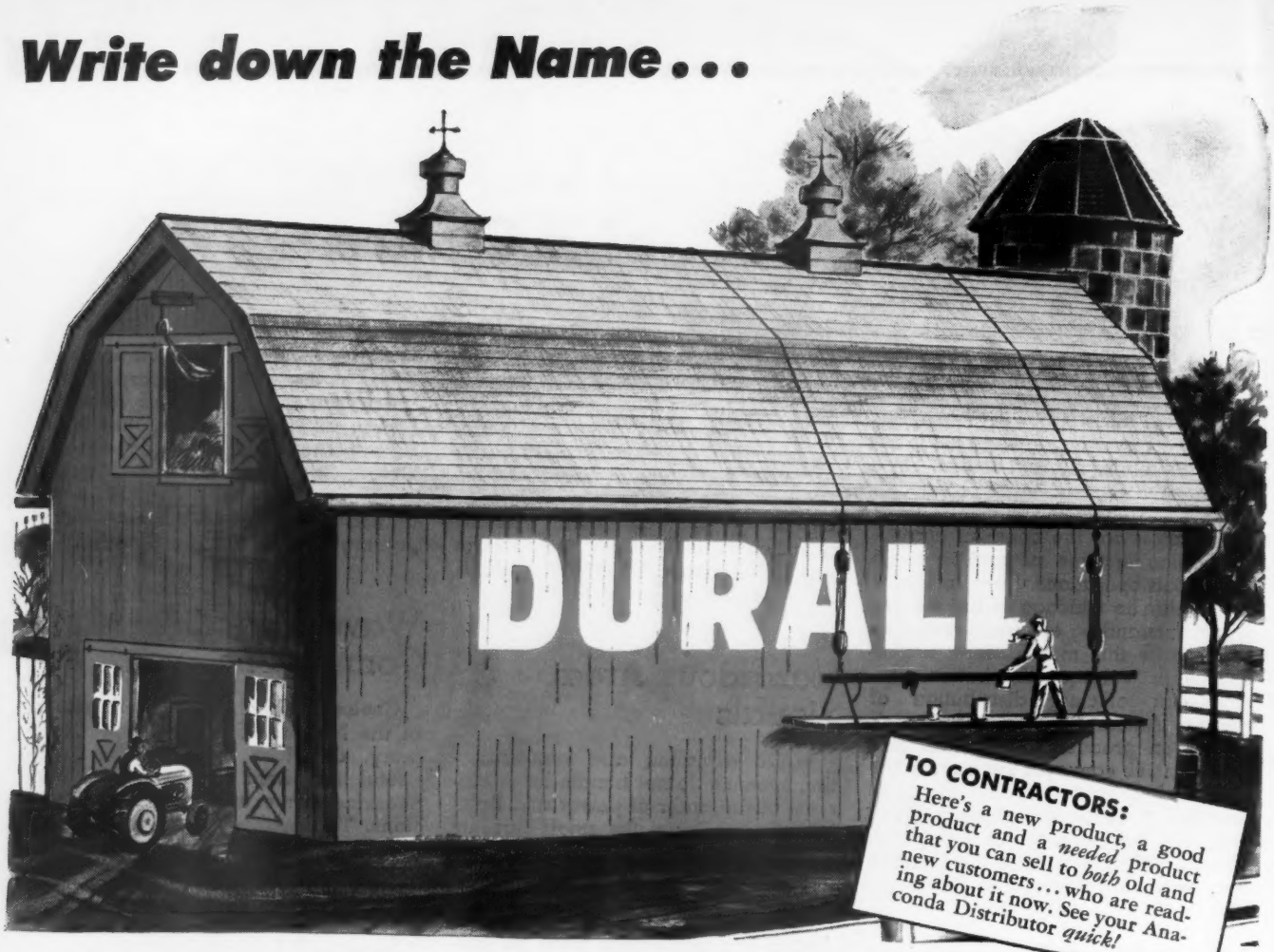
Crane Maintenance

The electrical maintenance of overhead cranes and conveyors is one of the most important and exacting tasks of electrical maintenance crews. C. B. Risler of the Industrial Engineering Department of Westinghouse presents a comprehensive discussion of the subject with pertinent observations on the selections and maintenance of electrical equipment on material handling of electric operations. His article, "Electrical Maintenance of Overhead Cranes and Conveyors" appears in the Industrial Electrification section, beginning on page 81.





Write down the Name...


DURALL
TO CONTRACTORS:
Here's a new product, a good product and a *needed* product that you can sell to *both* old and new customers... who are reading about it now. See your Anaconda Distributor *quick!*

...it's THE BARN WIRE

every farmer will want

Farmers *do* worry about barn wire. But they don't need to worry any longer, now that they can get Anaconda Durall Cable, the new, Underwriters approved, completely reliable barn wire.

Durall is a non-metallic-sheathed wire with a rubber-like insulation of Neoprene and a heavy protective jacket of the same tough, flame-resistant material . . . with no fibrous coverings to rot or fray.

Durall is strong electrically and physically. Both insulation and jacket are highly resistant to moisture, mold, rot and animal wastes. Durall will not support flame, is proof against most acids, alkalis and oils. This is a truly fungus-resistant cable.

The Underwriters' Laboratories, Inc. have approved DURALL as a "Non-metallic-sheathed cable having adequate fungus-resistant, and other necessary properties for use in cow barns and *other* locations where it would be subjected to conditions of heat, cold, moisture, corrosive fumes and fungus." Anaconda Wire & Cable Company, 25 Broadway, New York 4, N.Y.

49448

ANACONDA
from mine to consumer

DURALL BARN WIRE

MID-YEAR OUTLOOK

RECURRING BUSINESS JITTERS, inventory chaos and unsettled price conditions call for a mid-year check-up. On every side we hear folks taking a dim view of the months ahead and what they will bring in the electrical field. What's happened to our predictions that 1949 will sustain a dollar volume of five percent better than 1948? Should our optimism be revised in the light of current events?

TWO INDICES bear directly upon electrical construction activity for both long and short range appraisal. They are both well supported by accurate, authoritative and comprehensive statistics. The purpose of electrical work is to supply light, power, heat and communication; in a word, utilization. The rate of growth of utilization is measurable and its measurement provides a useful and significant index. Electric output at the end of April was running 5.2 percent ahead of the same week in 1948.

CONSTRUCTION ACTIVITY is also directly related to electrical work. Almost any construction project dollar involves a segment of substantial size for electric wiring and equipment. First quarter construction in place, according to the Department of Commerce, was 5 percent ahead of the first quarter of 1948. The sharp seasonal upturn occurred this year at a higher level than last year. *Engineering News-Record* reports of contracts awarded for the first four months of 1949 showed 18 percent ahead of the same 1948 period.

PRICE DROPS, plentiful supplies and sharpened competition must inevitably affect dollar volume, but there is already a marked loosening of long-shelved projects to take advantage of better prices. There is a good probability of greater physical volume of construction this year. The market, however, has taken a broad turn in character which is of the utmost importance in today's appraisals. Where it was almost statistical it is now highly discrete.

CONSIDERATIONS are now ignored that were once of the utmost importance. Lead-time on orders for other than special items, expediting, critical materials supply, backlogs, tie-in sales, allocations and all the problems keyed to inadequate materials and manpower are passing out of our industry language. Local stocks, warehouse pickup, approved brands, tight specifications, extra fives, competition and penalty clauses are signs of the times. All this can change the rules, often painfully, but the basic market opportunities are still solid.

IT IS ABUNDANTLY CLEAR, from current data, that utilization and construction are following a rising pattern almost exactly comparable in form and seasonal variations with the two past, and very prosperous years. An economic upset could affect the pattern, but it would take influences of very large proportions that are not now apparent. Short term economic bumps or jitters influence the timing, but rarely the substance of major construction programs.

A MID-YEAR LOOK at our January predictions detects some variations from current experience in detail, but the substance of the projection must stand unchanged. It is and will continue to be a very good construction year in dollar volume. The segment enjoyed by individual electrical contractors, wholesalers, or manufacturers, however, will be, more than ever before, a direct function of the sales effort put forth.

Wm. F. Stuart

FRESH AIR

is good business!

Oust fumes, heat, dust with Ilg

Your customers understand the need for good ventilation — because, when you clear the air in a plant, you clear the way for improved worker morale and increased efficiency. Ilg blowers and fans — distributed by Graybar — are the most efficient, best-built ventilating units you can provide. For each of your customers' ventilating needs, there's a standard Ilg unit that's "made to order."

HEATING, DRYING UNITS AND ACCESSORIES

In addition to the proper Ilg equipment for ventilating rooms and buildings of all types, Graybar has Ilg unit heaters for space heating and drying . . . plus all the accessories you need, including controls and wiring supplies.

Specialized planning help

The help of a Graybar Power Apparatus Specialist is available to you in surveying your customers' buildings to determine the best ventilating systems. (Or if all you want is a single unit, don't hesitate to call us; Graybar gives careful attention to every order).

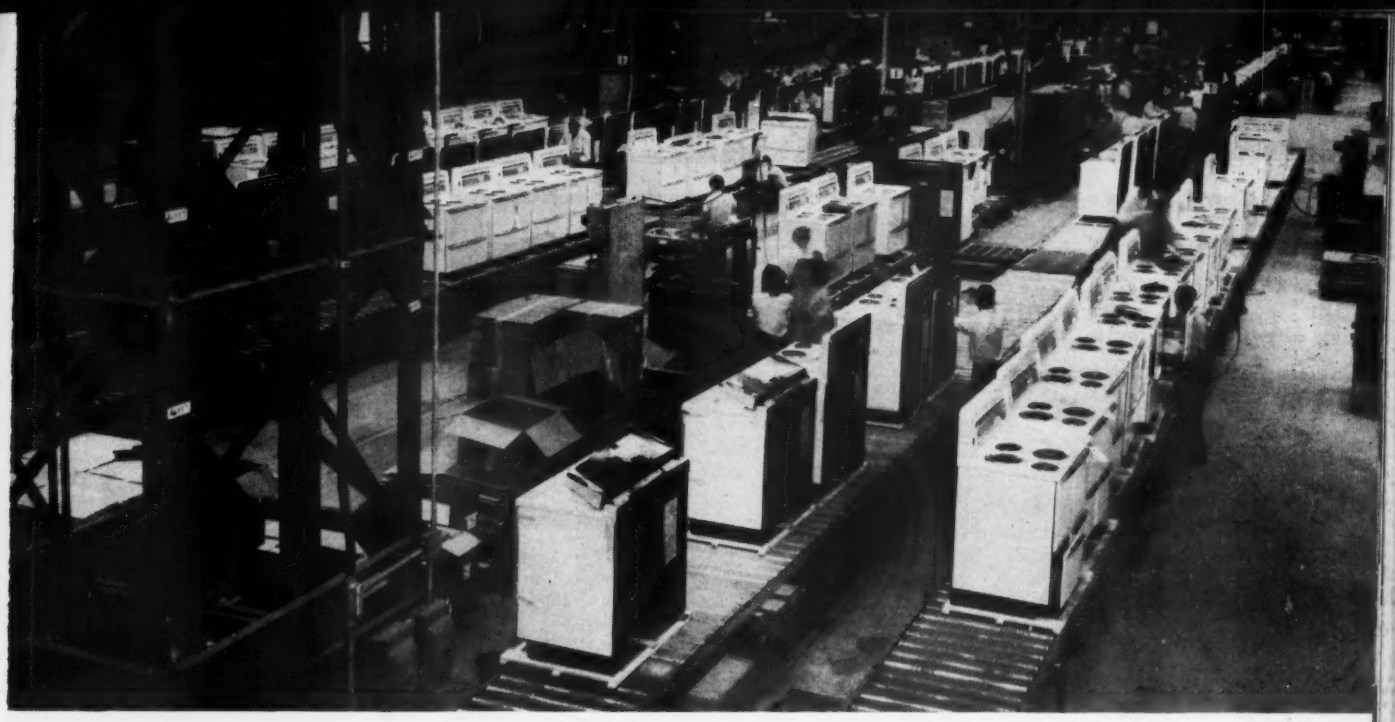
Everything for Contractors

Graybar distributes more than 100,000 different electrical items, including many contractors' tools — for wiring, lighting, communication, power, and all other electrical needs. A phone call to your local office will bring you catalog, price, and delivery information about anything electrical! *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.* 4920

IN OVER 100 PRINCIPAL CITIES

You get the best of everything electrical

Via GraybaR



FINAL ASSEMBLY LINES *pass one range every 30 seconds to warehouse conveyor elevators at Hotpoint's new range plant in Chicago. Final inspection and test stations in background are last steps in streamlined production setup.*

HOTPOINT . . . of CHICAGO

Radial-ring high voltage distribution; automatic electrical interlock and control on production machines and extensive conveyor system highlight the electrical installation at Hotpoint's new Chicago electric range plant.

By Oscar Sweningson

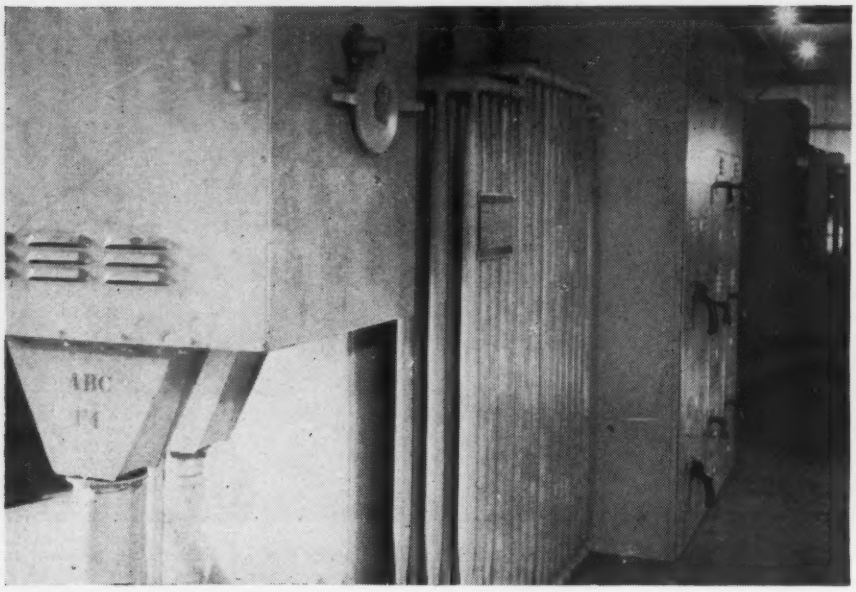
President, Sweningson & Company
Electrical Contractors and Engineers
Chicago, Illinois

TWO ranges per minute come off the assembly lines at the new Chicago plant of Hotpoint, Inc.—reputedly the largest plant in the world devoted exclusively to electric range production. Revolutionary mass production techniques, incorporating automatic materials flow and equipment control to a degree never before approached in this field, give the plant a rated capacity of 600,000 ranges per year, according to James J. Nance, Hotpoint president.

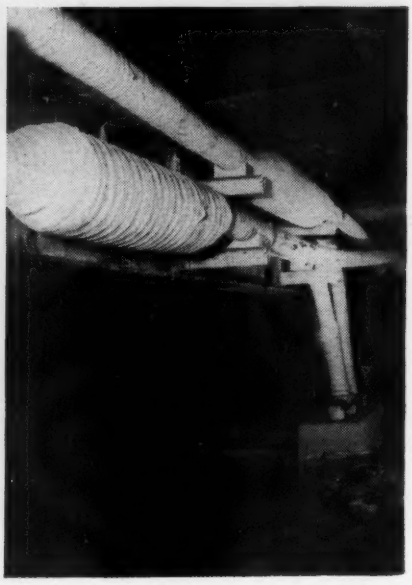
The new plant, designed and built by the Abell-Howe Company of Chicago, combines approximately 1,000,000 square feet of manufacturing floor area with some 7½ miles of conveyors (mostly overhead type) to provide a model of streamlined production flow. Range sub-assemblies and parts are stored on a portion of the overhead conveyor system (capacity—parts for 800 ranges), then are channelled to four assembly lines designed for maximum flexibility in changing from one model to another without interruption of over-all plant output. After final inspection and test, completed ranges are lifted from the assembly lines by elevators and placed on gravity conveyors, then go to the huge warehouse for crating and shipping.

Specially designed machinery contributes in a large measure to the efficiency of the closely integrated production system. Every 20 seconds, a completely fabricated and welded range body comes off the automatic body fabrication line; one large press with eight dies turns out a complete range drawer with each stroke. Overhead conveyors pass through eight infra-red ovens (total—1,300 kilowatts) to dry prime enamel coats on range parts; carry range bodies and sub-assemblies through four 1,125 kilowatt electric enameling furnaces to produce the gleaming white, porcelain, wear-resistant finish. Integrated in the over-all system is the mass production of the Calrod heating units, switch and control assemblies and other accessories and parts.

The heart of the entire plant operation—of uninterrupted production—is the carefully engineered electrical distribution system that serves a total connected load of approximately 19,500 kva. throughout the plant. Extensive application of automatic production control, electrical interlock, and split-second timing and speed control of conveyors dictated installation of a system that would handle in-plant and exterior system failures or outages without unreasonable production shutdown. Hotpoint engineers and Sweningson and Company, electrical contractors and engineers of Chicago, collaborated on the design of such a system. Design and installation highlights are reviewed in the following pages.



LARGEST ROOF SUBSTATION *contains two* 1,000 *and three* 750 *kva. transformers. Note dual potheads (feeder and emergency tie cable) on primary disconnect enclosure in foreground. Strap connections to key-locked switch are made inside enclosure.*



12,000-VOLT CABLES *are racked under substation floor. Splices and cable sheaths are fireproofed with asbestos tape.*

RADIAL RING DISTRIBUTION

To assure service continuity, the engineers designed a unique primary distribution that normally functions as a modified radial system but can be quickly converted to a ring type (modified selective primary) in an emergency. Prudent use of secondary tie-breakers, keyed primary switches, primary tie-feeders, and spare main feeders capacity provides an operating flexibility that will keep production flowing under practically any electrical emergency that may arise.

Dual 12,000-volt incoming power company circuits, with a primary bus tie-breaker, serve the plant. Through six 1,200-amp., air breakers (two spares), four 12,000-volt, underground circuits feed 16 substations located on mezzanines and in roof enclosures at plant load centers. Each primary feeder consists of a 3-conductor, 500MCM, lead covered cable in 4-inch fiber duct. Concrete enclosures contain tiers of six and four ducts; are identified outdoors by red concrete top (voltage stencilled in yellow) at about 25-foot intervals, indoors by continuous red top on duct line. Risers to substation level are enclosed in concrete columns.

Transformers, in general, are installed in groups of two. One unit of each group substation is fed by one primary feeder; the second unit of each group by a second feeder (see schematic diagram). Where a single transformer is installed, it is fed by both feeders; has a two-position primary breaker so the load can be shifted in case of a feeder outage.

In the case of dual transformer substations, each transformer has two primary potheads—one for the feeder serving it; the other for an emergency tie-feeder between the two units. Should a primary plant feeder fail, the transformer or transformers affected can easily be shifted to the other feeder by using the tie cable. Connection is made by shifting strap connectors at the dual potheads, just ahead of the transformer primary disconnect switch. If a transformer fails, it can be disconnected from the primary feeder and its load transferred to the second unit through a secondary bus tie-breaker. Both primary disconnects and the secondary tie-breaker are key-locked. With only two keys available, one must be open at all times. Each of the dual transformers can carry 75 percent of their combined loads. Each primary feeder has sufficient spare capacity to carry the combined loads of substations connected to it.

Should one of the incoming power company circuits fail, its load can be shifted to the other through the bus tie-breaker at the primary switch cubicles.

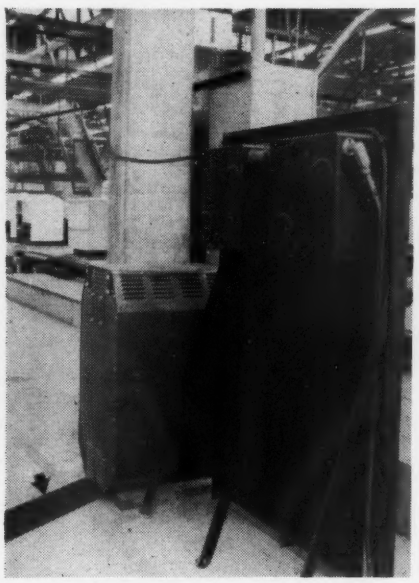
Secondary power is 480-volts, 3-phase for general manufacturing loads; 240-volt, 3-phase for heating furnaces and range test. Distribution is of the conventional radial type with conduit and wire circuits. Of the total connected load (19,500 kva.) approximately 30 percent is for electric heating; 55 percent for general power and 15 percent for lighting.

Lighting in the general manufacturing area is predominantly fluorescent consisting of industrial type units with two 100-watt, 3500° white lamps each. To eliminate re-enforcing building steel for long messenger cable runs, Unistrut channel was used as a supporting medium. With the exception of the final assembly and inspection areas, units were installed in pairs with space for future installation of every third unit. Circuits were designed accordingly.

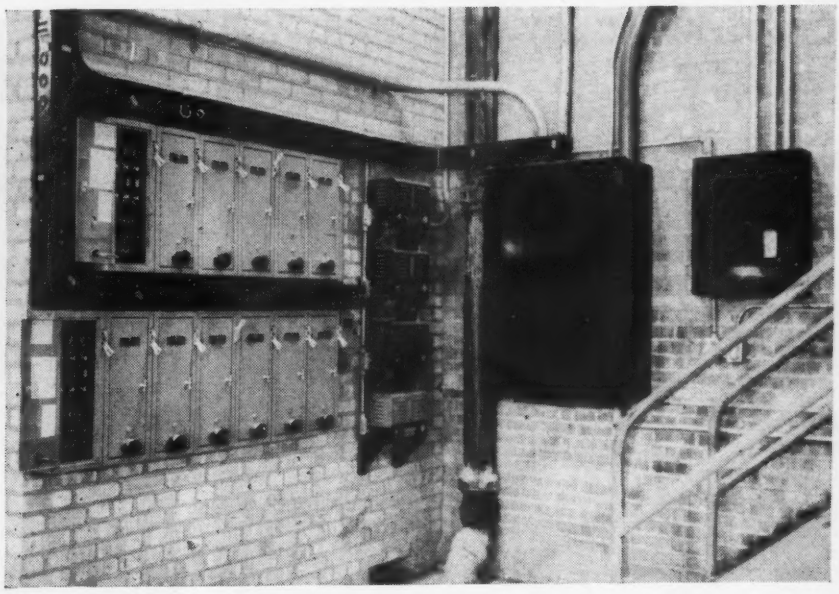
Maintained intensities vary in different areas. With fluorescent units in general manufacturing it is 35 footcandles; range test and inspection, 50-55; box shop (alternate 400-watt mercury and 750-watt incandescent units), 40 footcandles; warehouse (750 watt incandescent), 20-25 footcandles.

Lighting distribution panels were of the sectionalized type—one section controlling receptacles, two sections each controlling two bays of lighting. Each lighting section is operated by a magnetic contactor inserted in the bus circuit and mounted on the column directly behind the panel. Branch circuit conductors are installed in square wireways.

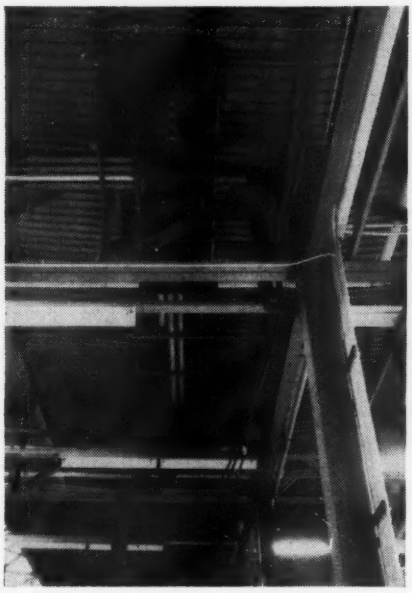
...Hotpoint of Chicago



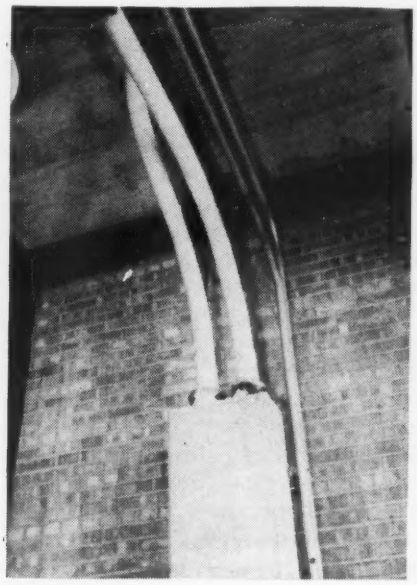
RANGE TEST *load center. Concrete column carries dual primary feeders to roof substation.*



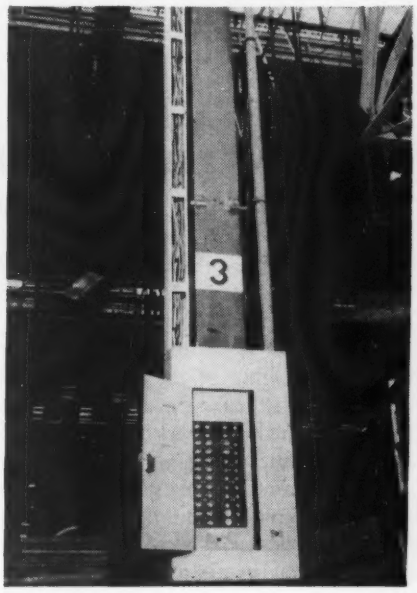
COMPACT CONTROL CENTER *in mill room where porcelain enamel emulsion is* **mixed.** *Line starters on left with manual and automatic control operate agitator motors.*



OVERSIZE PULLBOXES *carry 480-volt feeders to conduit raceways.*

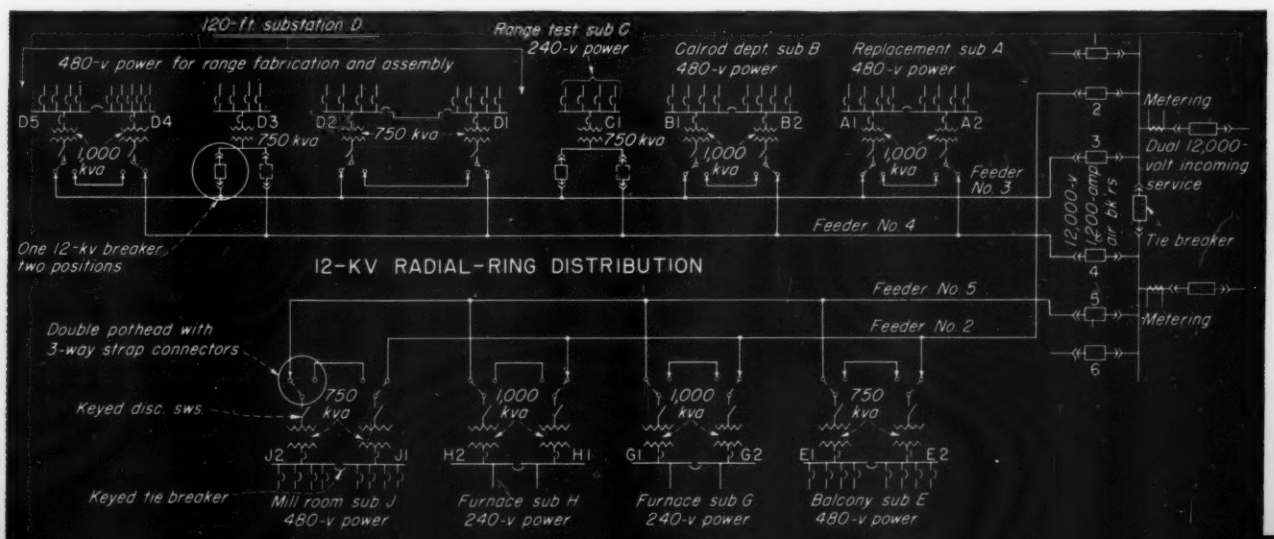


ASBESTOS-WRAPPED *primary cables leave concrete enclosed riser ducts.*

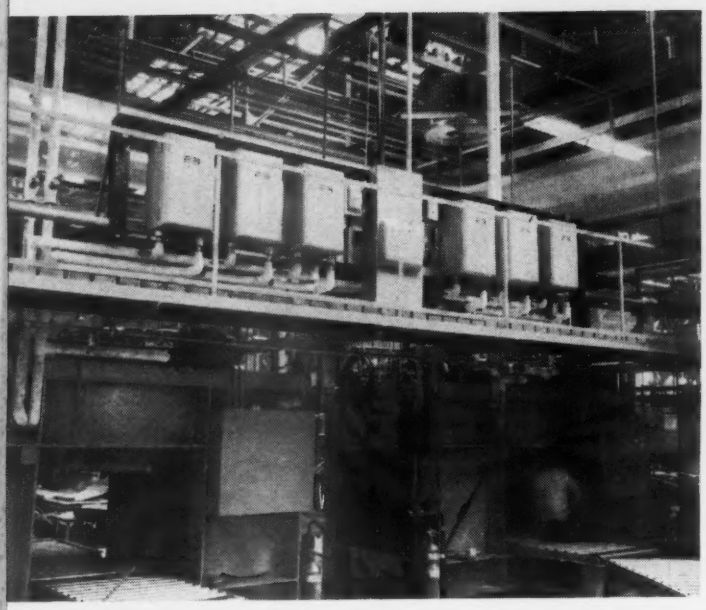


SECTIONALIZED LIGHTING *panel has square branch circuit wireway.*

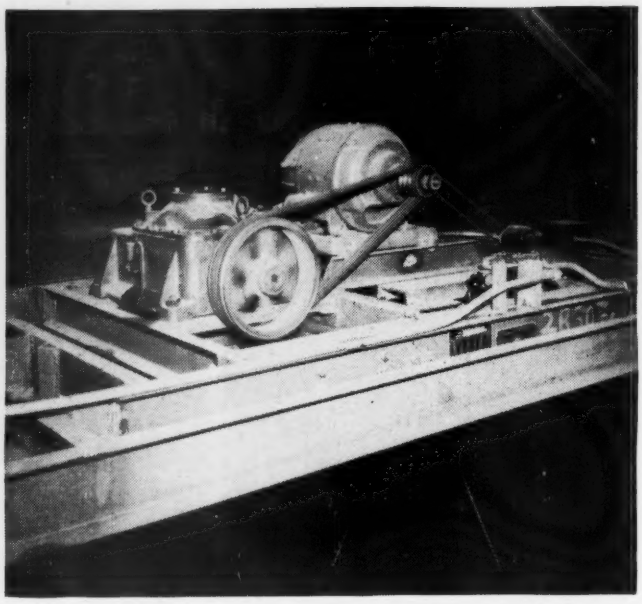
FLEXIBLE PRIMARY *distribution system serving transformer loads throughout the plant. Note two-position breakers on single units; 3-way strap connectors for shifting load in emergencies; key-locked primary disconnects and secondary tie-breakers.*



Outstanding Electrical Construction . . .



TUNNEL TYPE RESISTANCE *welders (one a spare unit) at end of range body fabrication line make 46 welds in single operation. Electronic controls on balcony have water-cooled tubes. Double-throw switch inserts second unit in circuit when welder contact tips need maintenance or replacement.*



MOTOR DRIVE ON *furnace conveyor has tachometer attachment for close voltage control. Thymatrol units provide close regulation.*

AUTOMATIC CONTROL

Installation of the general distribution system was the simplest part of the project. Far more complicated—and fascinating—was the extensive application of automatic control on both production equipment and the conveyor system.

Production is so integrated and mechanized that a piece of steel arriving at the plant in the morning will emerge as a completed range in the warehouse that same afternoon. Such a schedule requires split-second timing of conveyor speeds, numerous multi-operation presses with intricate electrical control and interlock systems; accurate positioning and timing of automatic fabrication lines. Once an operator presses a button, the electrical system takes over and he remains a watchman of the process.

Outstanding examples of this mechanized production are the 450-ton, 8-station, range drawer press that requires 17 motors to operate its ram, elevator, positioning devices, clamp cars, lubrication system, etc.; and a smaller 250-ton trim-ring press that requires 15 motors for operation. Amplidyne units furnish direct current for press control. Wiring cost for one press alone was aproximately $18,000.

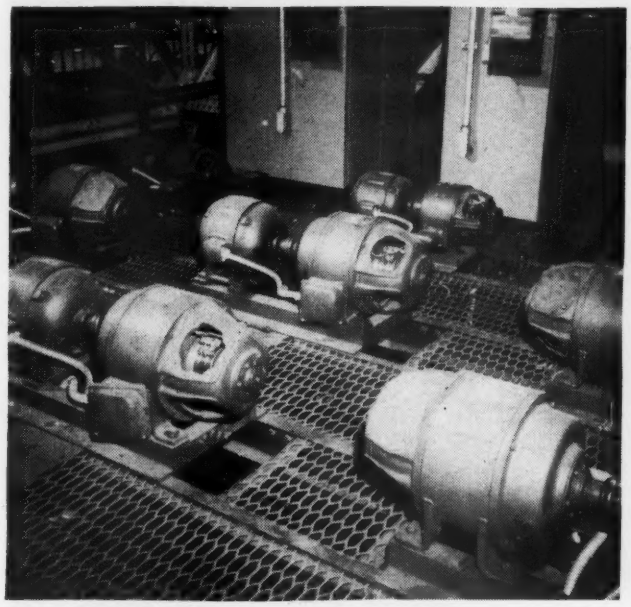
The range body line is made up of four presses (each powered by an 80 hp. motor), folding machine, tack welders, and two tunnel type resistance welders (one spare) that make 46 welds in a single operation. All units are tied together by a conveyor system. Operation of the line is electrically timed, controlled and interlocked.

Especially critical is the speed of the conveyors passing through the electric enameling ovens. Each oven conveyor is accurately controlled by a Thymatrol unit. Selective

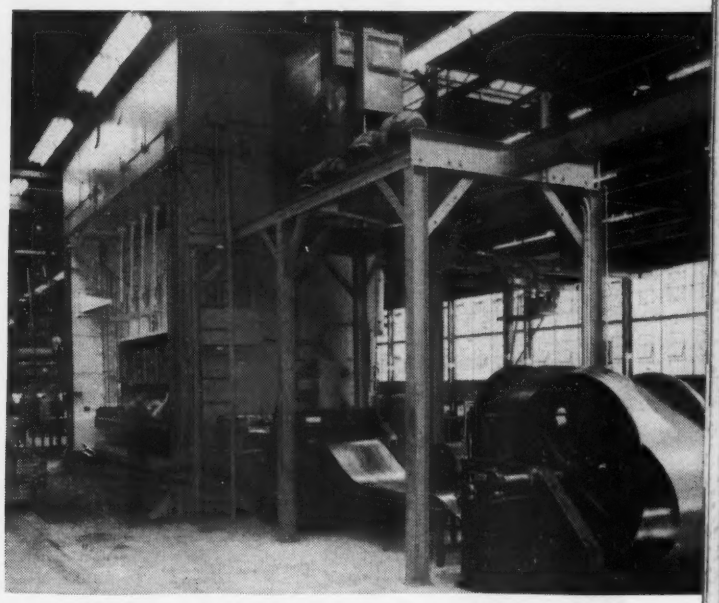
ENAMELING FURNACE *control and instrument boards (right) use square duct for control circuits.*

INFRA-RED DRYING *oven (Raymersion)—one of eight in the plant—is fed by conveyor carrying range oven liners.*

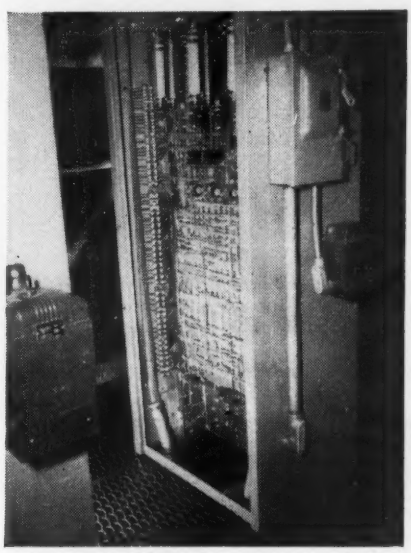
...Hotpoint of Chicago



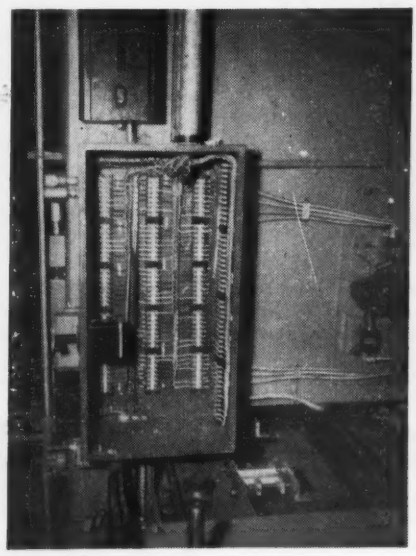
GROUP OF AMPLIDYNE *units on drawer press balcony furnish direct current control for press operation.*



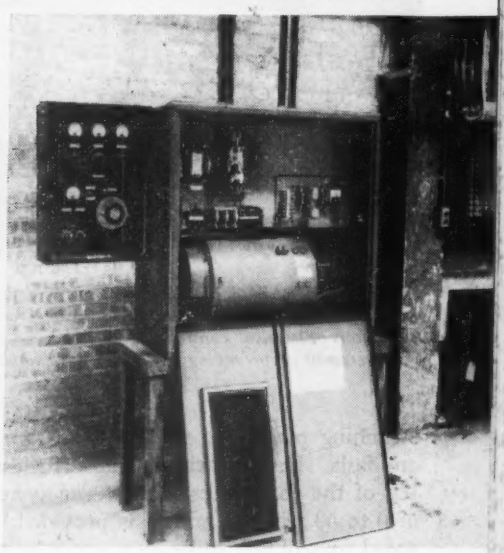
RANGE DRAWER PRESS *makes drawers in six operations; requires 17 motors for operation; has control equipment installed on balcony.*



INTRICATE CONTROL *circuits in back of one of three cabinets on 450-ton drawer press balcony.*

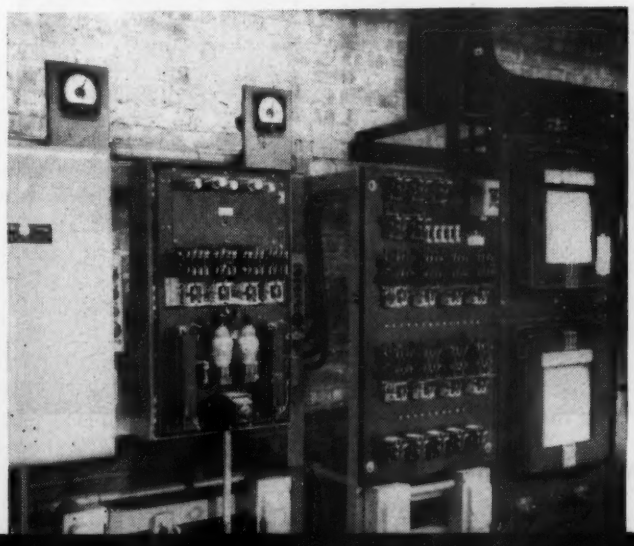


TERMINAL STRIP CABINET *on 250-ton trimming press indicates complicated control required to operate the 15 motors on the press.*

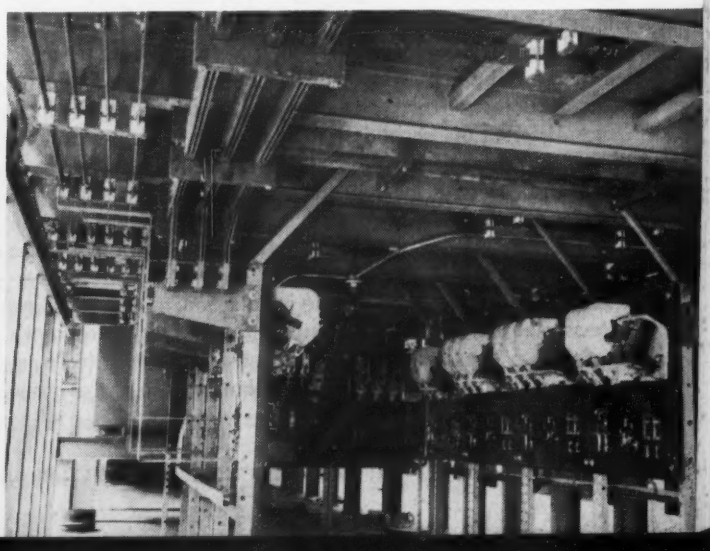


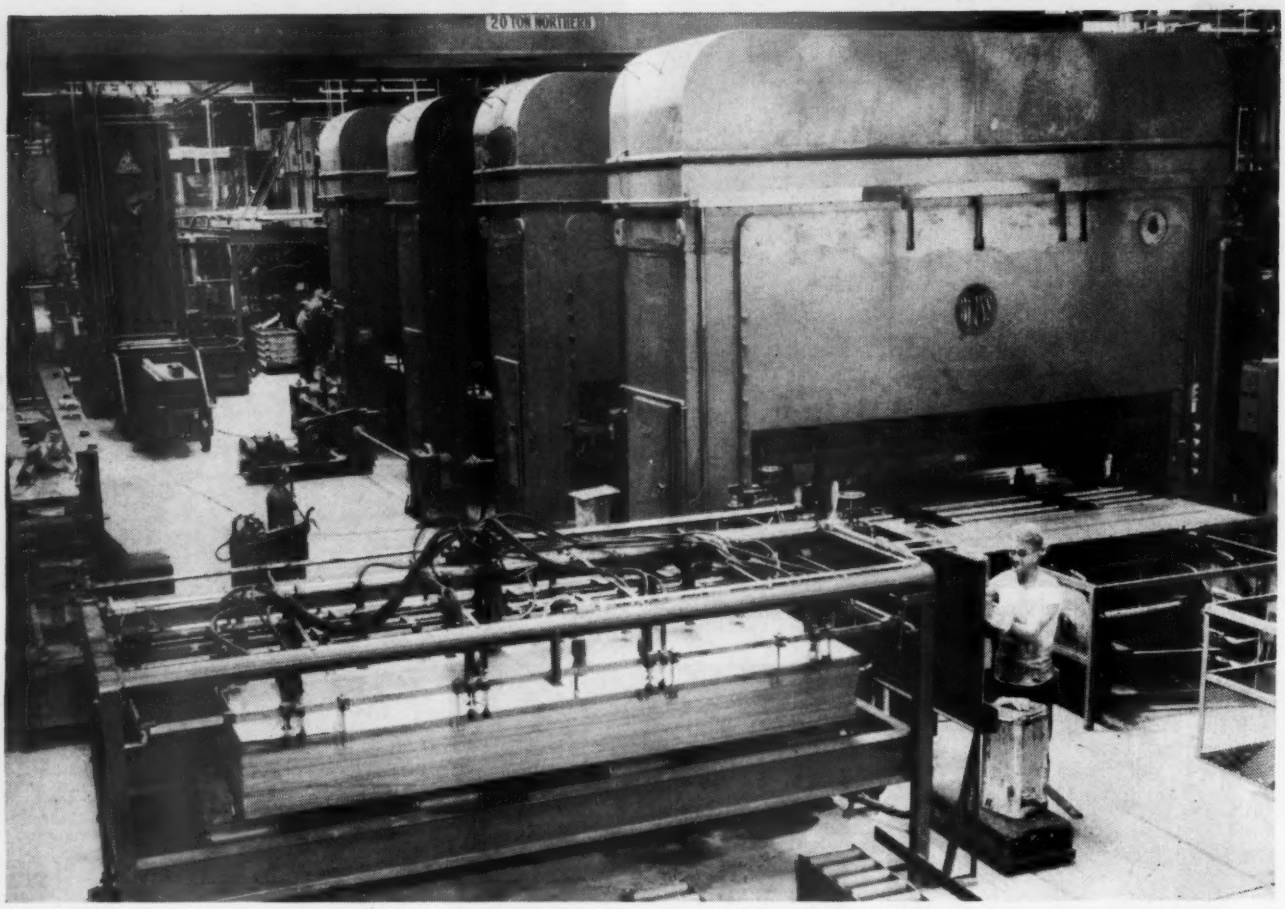
VARIABLE SPEED CONTROL *unit serves three storage conveyor motors; provides speed range of 0 to 60 feet per minute*

THYMATROL UNITS *on furnace conveyors provide plus or minus one percent speed regulation regardless of conveyor loading.*



CONTACTORS UNDER *enameling furnace provide individual automatic control of 10 different heating zones.*





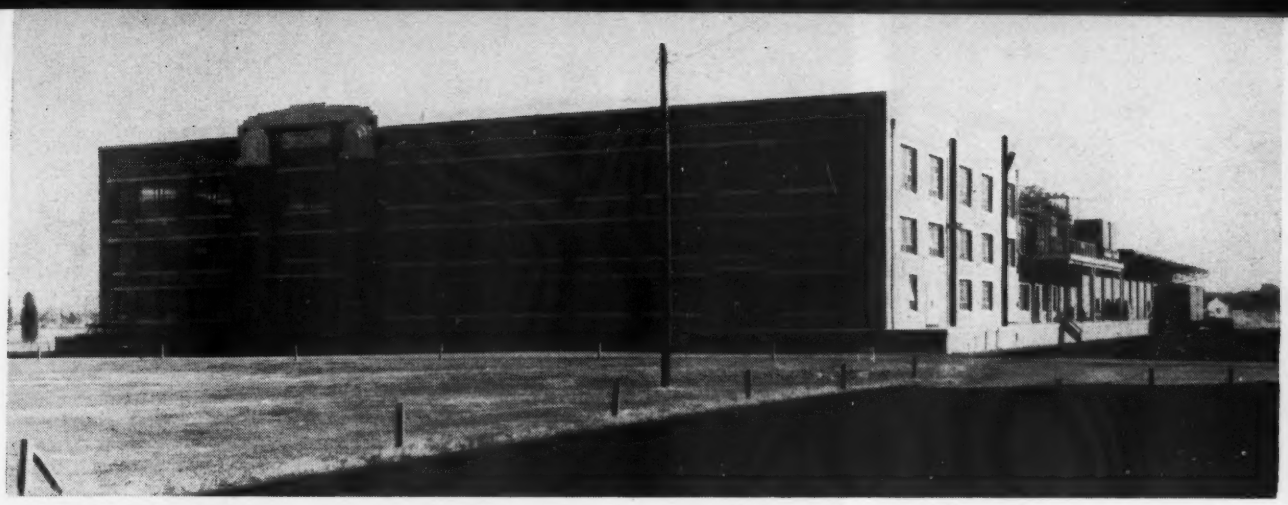
AUTOMATIC RANGE BODY *fabrication line produces a complete body every 20 seconds. Four presses in foreground are each driven by an 80 hp. motor. Electrical control and interlock provides split-second timing of progressive steps ending with automatic tunnel welder.*

TYPICAL CONTROL STATION *for infra-red drying oven. Cubicle at right is for oven control; switches at left control auxiliary motors on spray booths through which parts go before entering oven.*

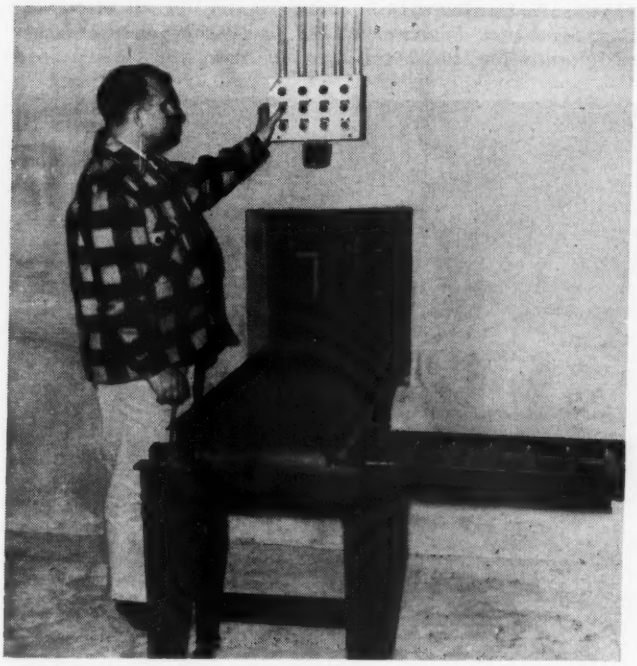
switching permits a shift to a spare control unit in case one fails. Less critical, but nevertheless important, is timing of the parts storage conveyor system. A speed range of 0 to 60 feet per minute is provided by an a-c adjustable speed control unit utilizing a motor-generator set with electronic excitation of the generator field.

The vast amount of production equipment and the extensive overhead conveyor system made the electrical system definitely a custom-built installation. Accurate field measurements were the rule with close clearances frequently dictating installation techniques. To maintain high efficiency of the electrical crews, the contractor organized highly specialized groups—one for the enameling furnaces; another for the conveyor system; another for the intricate control wiring on production equipment; another for primary distribution, secondary systems and so on. At their disposal was some $40 to $50 thousand dollars worth of hand and power tools—including 18 metal cutting band saws.

Field engineering played a vital part in unraveling the snags inherent in large projects where multiplicity of systems and control complicate the installation. Despite delays in material deliveries, close cooperation between Hotpoint's engineering departments and the contractors permitted completion and operation of the huge plant within the original 15-month schedule.



NEW QUICK-FREEZE AND COLD STORAGE *plant of Phillips Packing Company, Inc., Cambridge, Md., is accessible by rail, highway and water. Electric power is furnished by substation on side of building.*



SELECTOR SWITCH, *under motor push button controls, permits routing of packaged foods to either of the four cold storage rooms. These controls are located on wall in the food processing and packaging room.*

Quick-Freeze And Cold Storage Wiring

Automatic electric control of below-zero temperatures, packaging processes and conveyor systems are featured in new quick-freeze and cold storage plant.

By McCoy A. Tall

Superintendent,
Electrical Construction and Maintenance
Phillips Packing Co., Inc.
Cambridge, Md.

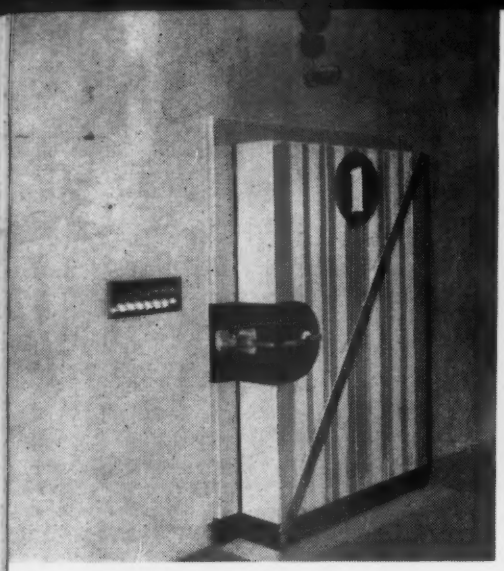
A NEW modern, scientifically designed, constructed and equipped quick-freeze and cold storage plant has been completed by Phillips Packing Company, Inc., producers of "Phillips Delicious" quality-controlled canned soups, vegetables and meat products. This plant at Cambridge, Maryland adds an important new unit to this company's other food processing plants. This location is on the east side of the Chesapeake Bay, in the heart of Maryland's Eastern Shore, nationally known for its fine fruits, fresh vegetables and excellent seafood.

Construction was begun on this new plant in 1946. It embodies the best skill and knowledge of the industry, so that in every phase of its structural and operational facilities it represents the most seasoned and experienced craftsmanship known to quick-freeze and cold storage authorities. The electrical installation forms the heart and core of its operation, and automatic control features are closely integrated with all processes, production routines and storage techniques.

The building is constructed of masonry and steel. It is 150 feet wide and 450 feet long. It has below-zero storage capacity of ten million pounds in four storage rooms, each 75 feet by 100 feet with 12-foot high ceilings. It is completely equipped with a continuous quick-freezer, ice-making and ice-storage rooms, engine room with all electric control panels for all electric facilities, and various vegetable, fruit and seafood processing and packaging rooms, including the most modern facilities for bulk and consumer-package freezing and storage.

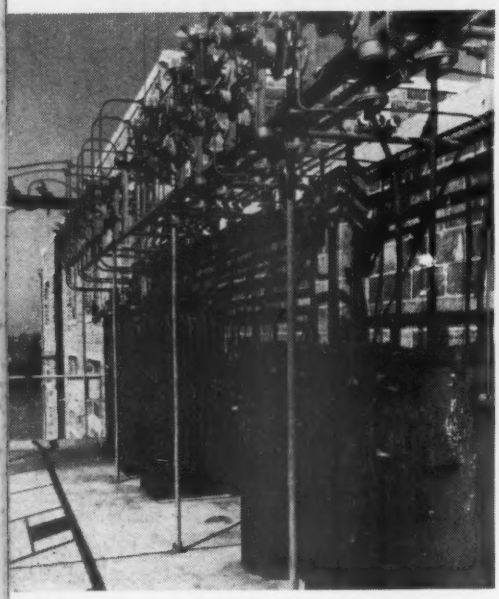
Power for the Phillips food plants is supplied from a 4500 kva. substation owned by Eastern Shore Public Service Company. This substation is located on the plant property, and serves the Phillips plant requirements only. The substation consists of four 1500 kva. transformers, with one transformer being used as a spare to prevent plant shut-down due to transformer failure. The transformer bank is connected delta-delta. Primary voltage is 44,000 volts, 3 phase, 60 cycles, which is transformed to 2300 volts, 3-phase, 60 cycle secondary for distribution to the various individual plants, spread out over a relatively large area.

A separate 2300 volt, 3-phase, 3-wire overhead line was run from the

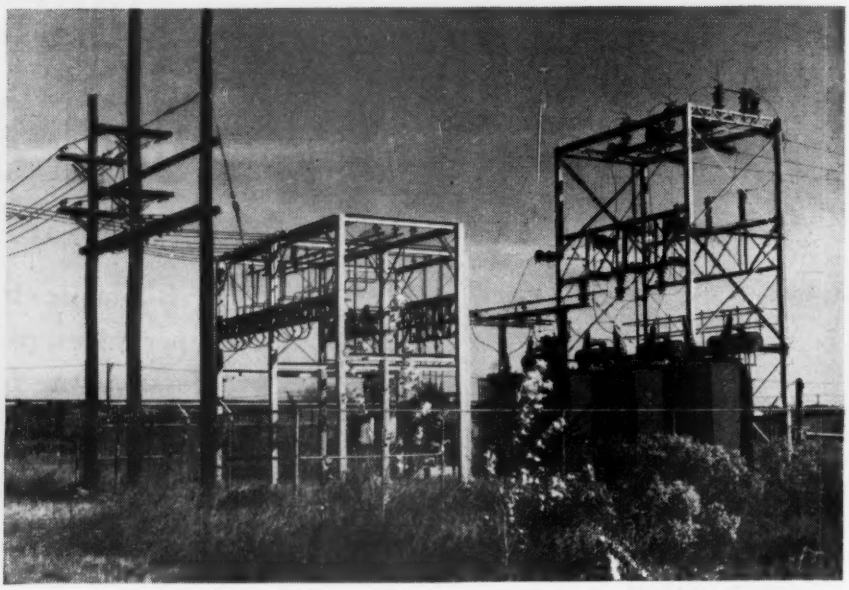


GANG PLATE SWITCHES *with pilot lights control cold storage room lighting. Alarm over door is a safety measure.*

SPECIAL DESIGN MAIN SWITCHBOARD *is control center for all electrical facilities and temperature regulation. Panels at left are for 440-volt power, at right for 220-volt power, and in center for 110/220-volt lighting.*



2300-V. PRIMARY is converted to 440-v. and 220-v. secondary for power, 110/220-v. secondary for lighting.



MAIN OUTDOOR SUBSTATION *with four 1500 kva. transformers supplies power to 20 Phillips food processing plants at 2300 volts secondary. Primary voltage is 44,000 volts. One transformer is used as a spare.*

main outdoor substation to the new quick-freeze and cold storage plant substation. This new plant substation was installed outdoors on a special platform constructed over the loading platform on one side of the building. This special platform supports not only the transformer substation, but also evaporative condensers which provide cooling for the cold storage system gases. A special concrete curb was built up around all sides of the substation platform, designed to hold the total capacity of oil from all transformers in case of leakage and drains to convey oil away from plant areas.

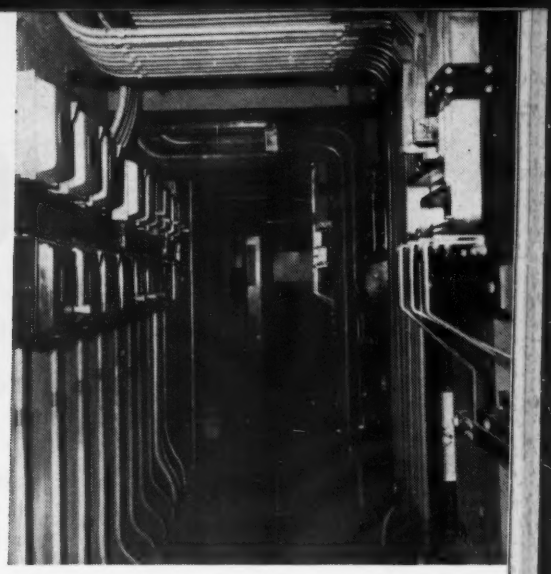
The plant substation consists of seven transformers, six for power and one for lighting. The lighting transformer is 100 kva., 2300-volt primary, 110/220-volt secondary. Three of the power transformers are rated 333 kva. each, 2300/440-volt, single phase connected delta-delta, and three are rated 100 kva. each, 2300/220-volt single phase. The entire substation and structure is well grounded.

The main switchboard, located in the engine room, is inside the building adjacent to the substation platform. Three lines of Trumbull Buss-Wa are used to conduct the secondary power from the transformer banks to the main switchboard. This Buss-Wa is run across the roof from the substation to a penthouse, where it enters the building and drops vertically to the switchboard. The penthouse was constructed as a weather protection to the flashing where the Buss-Wa enters the building. An asphalt-treated aluminum covering houses the Buss-Wa from the transformers to the switchboard.

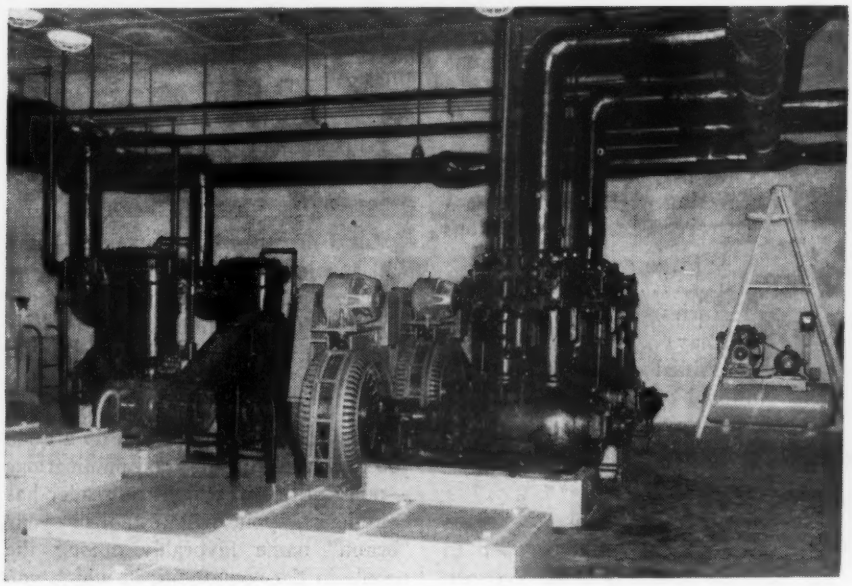
The main switchboard forms the nucleus of control for the entire plant. Specially designed, it incorporates control of all electrical facilities within the plant and recording temperature gauges for all cold storage rooms. From this one point temperatures from freezing to sub-zero are reliably and readily regulated, and the automatic temperature recording gauges maintain a permanent record continually of the exact temperatures in each of the 2,500,000-pound storage rooms.

The switchboard is located in the same room with the large compressors. Individual switches and gauges are provided for each compressor. Operation is automatic and requires a minimum of attention, primarily that of watching the recording instruments.

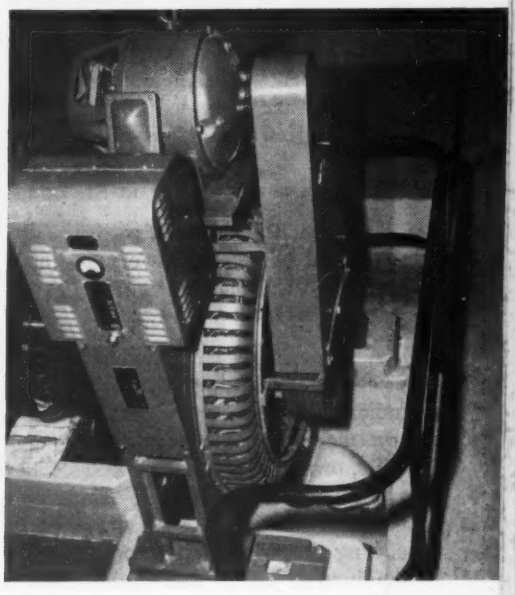
BUSDUCT SUPPLIES POWER *from substation on side of building to main switchboard in engine room. Busduct entrance into building is enclosed in a penthouse (right) as a protection against severe weather conditions.*



SWITCHBOARD WIRING AND ASSEMBLY *was done by Phillip's own Electrical Department.*



COMPRESSORS *are powered by 100 hp. synchronous motors to maintain below-zero temperatures in cold storage rooms. Concrete bases (foreground) for additional compressors will permit future expansion if needed.*



PUSHBUTTONS *control synchronous motors powering compressors. Note standard service head on conduit.*

Switchboard panels are of the standard flush type, formed of rolled-edge ⅛-inch thick metal. It was job-assembled by the company's own electrical department, and gives the appearance of a standard factory assembled board. Equipment used consists of Westinghouse power breakers, Bulldog lighting breakers, Taylor spring-wound temperature recording instruments and Allen-Bradley starter switches. Panels at the left end of the board are for 440-volt power, in the center section are for lighting, and at the right end are for 220-volt power.

At the left end of the switchboard a temperature safety alarm has been installed. Solenoid operated, it sounds an alarm to indicate an abnormal temperature rise in either of the four cold storage rooms. This alarm is equipped with a two-minute delay provision to permit the compressor to start up automatically during this interval before sounding. If the compressor fails to start, the alarm sounds so that an attendant may investigate and remedy the existing trouble.

The compressors are powered by 100 hp. synchronous motors, automatically started by pushbutton control. Standard service heads are used on the conduit end which is installed underfloor, to eliminate capillary action of oil dropping from above, and to eliminate the danger of broken condulets and damage from overhead. A safety rail also encloses the motor on each compressor. Foundation platforms have been installed in the engine room for additional compressor units, to provide any future capacity requirements.

A motorized belt conveyor system handles all products throughout the building. This system is controlled from the processing and packaging room. The operator determines where the product is to go as it leaves the packaging room, and by means of a selector switch routes the product to either of the four cold storage vaults as required. The conveyor system consists of one main conveyor belt, and four branch conveyor belts, one to each cold storage room. A diverter is installed over the main belt at the point where the branch belt system joins the main conveyor line. The selector switch in the packaging room automatically controls the solenoid and motor for each branch belt line, providing complete mechanical and elec-

[Continued on page 164]

HOW MOTOR SHOPS SELL

An industry-wide survey of advertising methods and practices used by electric motor repair shops with an advertising man's comments.

By W. W. Garey and W. T. Stuart

ADVERTISING and sales promotion for the electric motor service shop offers opportunities for development. To explore current practice, *Electrical Construction and Maintenance* surveyed a large segment of the N.I.S.A. shops. The proceeds of the survey are presented in this article. They also form the basis for a report presented by the authors to the N.I.S.A. annual meeting in St. Louis.

Question 1. Do you advertise?
Total Number Answering—180
YES—173 or 96.1%
NO—5 or 3.9%

A surprisingly large number of service shops are using advertising. This indicates to me a very healthy industry, made up of many strong small units, owner-operated businesses. They are competitive, but with competition based on selling the service, not on cutting the price. Where price cutting dominates, you'll find little creative selling. Price-cutting is not selling. It is rather an admission of inability to sell.

Question 2. What percent of your annual sales volume do you spend for advertising and sales promotion in a year?

Total Number Answering—147
Less than 1 %—42 or 28.6%
1 %—41 or 27.9%
1½%—14 or 9.5%
2 %—18 or 12.2%
More than 2 %—32 or 21.8%

Only one-third of those answering this question are spending 2 percent or more of sales dollars on advertising 33 companies answering question 1 didn't answer question 2. Skipping the few who might have felt this was information they couldn't release, there are probably quite a few who *don't* keep adequate records to know how much they're spending.

This suggests a more or less haphazard interest in advertising of an industry not particularly pressed to sell at the time this survey was made. Selling was not the major problem.

Question 3. What media do you use?

Total Number Answering—179
Direct Mail.....127 mentions
Billboards ..... 4 "
Newspapers
Display ..... 61 "
Classified 63
Local Mag. & House Organs
Display ..... 29 mentions
Classified ..... 17 "
Radio ..... 15 "
Directories
Display ..... 63 "
Classified ..... 94 "
National or Regional Mag.
Display ..... 14 mentions
Classified ..... 17 "
Others ..... 32 "

Direct mail is heavily used. This is understandable and quite proper in your business which is local. You can build and maintain good lists without too much trouble.

Newspapers and directories are fairly well represented. Local magazines and house organs are used by a relatively small number of motor shops.

What media should be used?

Each type of advertising media has its economic place in sales promotion. Roughly speaking, the cost of different selling media runs something like this:

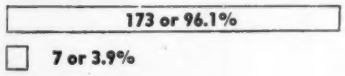
1 sales contact—$10.00
1 direct mail contact—$.10
1 publication advertising contact—$.01

Local newspapers, magazines, radio will enable you to contact a very large number of people at very low cost per contact. This medium should be used to let the largest possible number of customers and prospects know what you have to offer. What can you do in the way of service? If you do a good job of advertising in good publications—publications in which the reader has confidence, you will establish your "brand" name favorably among the people in the community in which you wish to serve. Sure, there are lots of folks reading the newspapers who don't use your type of service. But it never will do you any harm to have them think well of you. They may

MATT RILEY *figures that maybe calendars are good but not always the most effective use of the ad dollar.*

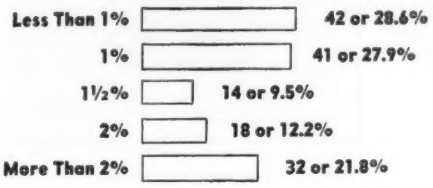
Do You Advertise?

Number Answering — 180



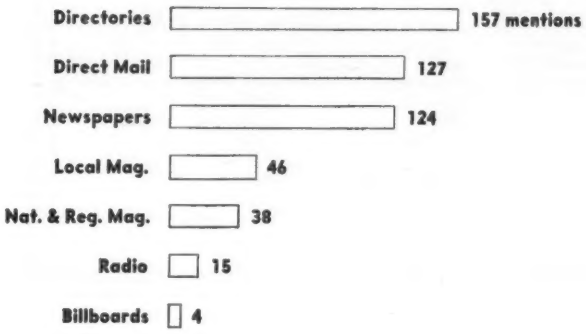
What Percent of Your Sales Do You Spend for Advertising?

Number Answering — 147



What Media Do You Use?

Number Answering — 179



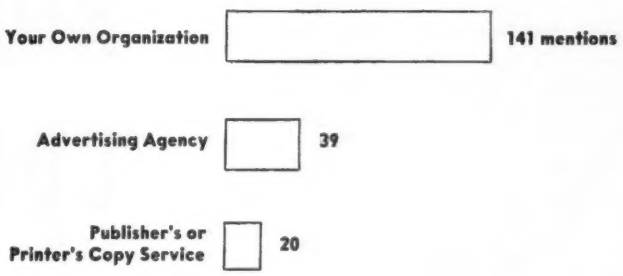
What Media Gives You the Best Results?

Number Answering — 127

	1st Choice	2nd Choice	3rd Choice	Total Mentions
Direct Mail	89	11	5	105
Directories & Catalogs	19	21	16	56
Newspapers	22	18	10	50
Nat. & Reg. Magazines	8	10	3	21
Local Mag. or House Organs	3	5	4	12
Radio	2	4	1	7
Calendars	1	0	2	3
Billboards	1	0	0	1

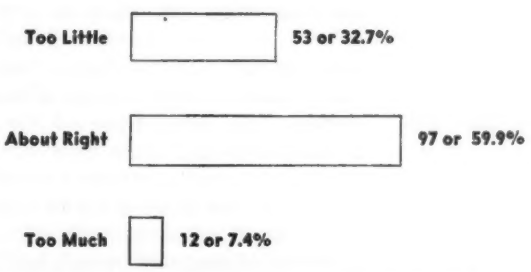
Who Prepares Your Advertising?

Number Answering — 168



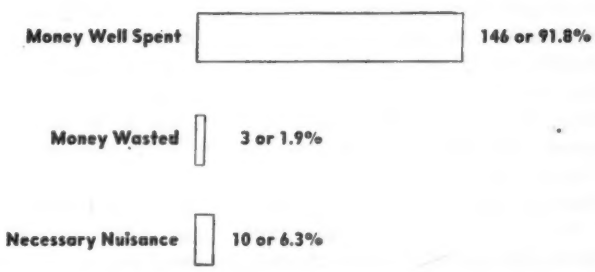
How Do You Feel About Your Present Budget?

Number Answering — 162



How Do You Feel About Advertising Expense?

Number Answering — 159



play golf with the men who do mean a lot to you.

Don't worry about all those who aren't directly interested in your service. Think of all those who can swing promises your way who are going to be influenced by your regular sales message. With a low cost medium you can afford to make a lot of contacts, many of which are unknown, but not necessarily worthless.

Out of your publication advertising —if it's effective—you should develop a list of good prospects along with having already created a favorable atmosphere for selling. Direct mail is put to work to do a more limited, more concentrated sales contacting job. Cost per contact is higher. Therefore, the number and the buying importance of those contacted must be more selective. You can talk more specifically.

Part of the problem of direct mail is to get it read, get it believed and to get action of some kind from the recipient. Your publication advertising will help you get better results from your direct mail.

Out of your publication advertising, your direct mail work, you should develop a small but valuable flow of good sales leads. On these you can afford to put direct personal selling to work. Personal selling is costly but of course, if it's good its the most effective of all. It is employed only on prospects of known, active buying power.

This picture of the place for each type of media is necessarily a broad one. The principles are important. You can apply them to your selling.

[Continued on page 159]

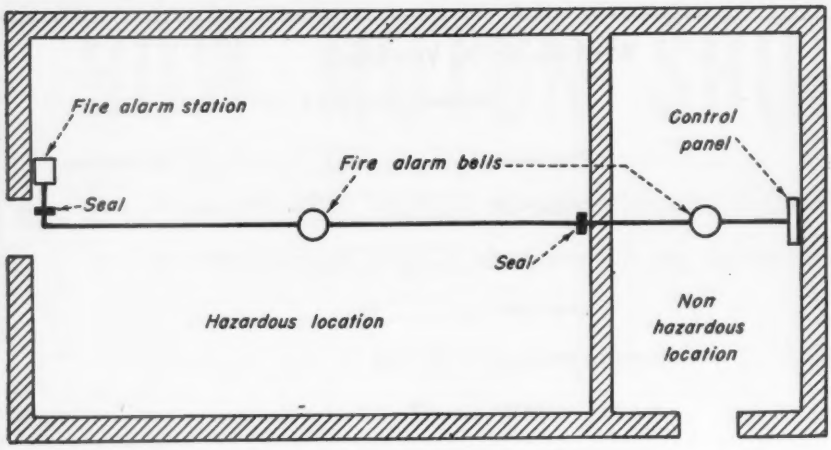


FIG. 1—*Typical example of sealing and running conduit from a hazardous location to a non-hazardous location.*

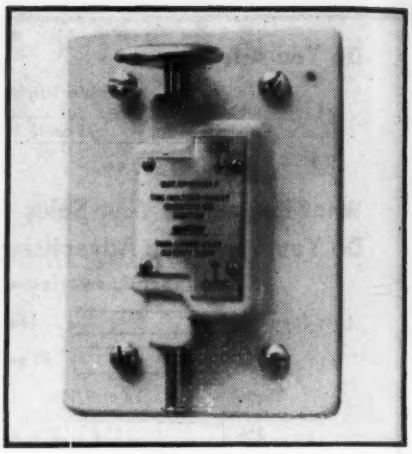


FIG. 2—*Faraday explosion-proof operating room calling station.*

SIGNALING AND COMMUNICATION

for Hazardous Locations

THE demand is rapidly increasing for various types of signaling and communication systems which may be used and installed in hazardous locations. Up to the present time it is impossible to procure component parts which carry Underwriters approval and which meet every condition. It is therefore a matter of ingenuity to plan and make layouts which will eliminate certain unprocurable equipment from hazardous locations and place standard Underwriters approved items in non-hazardous locations, but not too remotely from the point desired. An example of this is to place an approved auxiliary fire alarm station in the hazardous area, and then place a standard coded transmitter in the non-hazardous location. In this way a definite code will be transmitted to identify the dangerous area.

Generally speaking, all equipment regardless of voltage must be of a type approved for use in explosive atmospheres. This includes bells, horns, pushbuttons, relays, resistances, sirens and the like. The enclosures must therefore be provided with threaded hubs and suitable covers.

The only type of wiring which is approved is rigid metal conduit which must be threaded into explosion-proof joints and fittings having at least five threads engaged. In addition it is necessary that the conduit be sealed off in an approved manner at points (1) where arcing may occur such as at make and break contacts in switches, pushbuttons and relays, (2) wherever a conduit leads from a hazardous to a non-hazardous location. Figure 1 illustrates these points.

The characteristics of hazardous atmospheres differ, consequently, the design and construction of equipment to be installed in those locations must be based on such facts. The following is a classification of hazardous locations:

Class I, Group A, Atmospheres containing acetylene;
Class I, Group B, Atmospheres containing hydrogen or gases or vapors of equivalent hazard such as manufactured gas;
Class I, Group C, Atmospheres containing ethyl ether vapor;
Class I, Group D, Atmospheres containing gasoline, petroleum, naptha, alcohols, acetone, lacquer solvent vapors, and natural gas;
Class II, Group E, Atmospheres containing metal dust;
Class II, Group F, Atmospheres containing carbon black, coal or coke dust;
Class II, Group G, Atmospheres containing grain dust;
Class III, Locations in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, used or stored.

The hazards of the three classes of locations may be summed up as follows: Class I, Highly inflammable gases or vapors, Class II, Combustible dust, Class II, Combustible fibres or flyings. The 1947 edition of the National Electrical Code is quite explanatory and is specific insofar as possible in detailing the many locations covered under the three classifications.

Available equipment which has been approved for signaling come under Class I, Groups B, C, and D, and Class II, Groups E, F and G and Class III. Equipment for telephone systems come under Class I, Group B, C and D. Equipment for sound systems come under Class I, Group D.

An operating room station of the explosion-proof type used with nurses' calling systems is shown in Figure 2. This unit is approved under Class I, Groups C and D. It consists of a heavy switch mechanism of special design encased in a cast outlet box which is threaded for three-quarter inch conduit and is covered by a cast plate. The switch is operated by a plunger, the

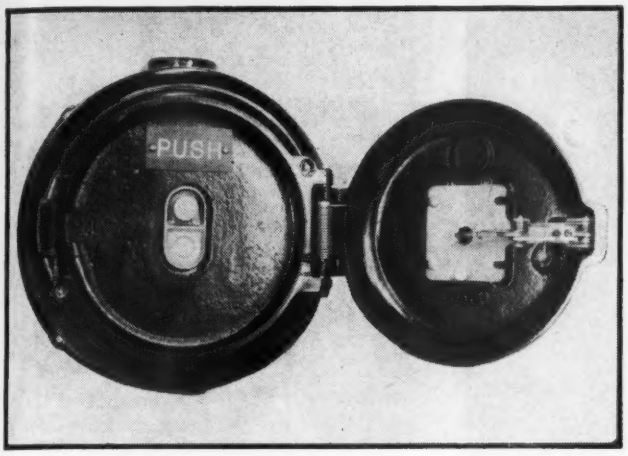


FIG. 3—*Faraday explosion-proof auxiliary fire alarm station.*

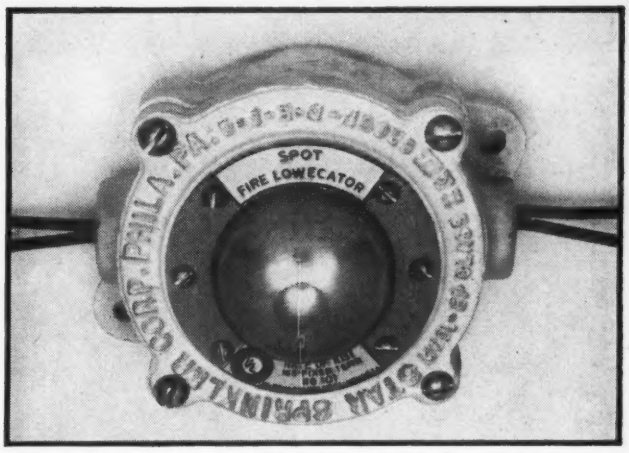


FIG. 4—*Spot Fire Lowecator thermostatic detector.*

Special devices and critical installation techniques required in hazardous areas.

By A. A. Schuhler

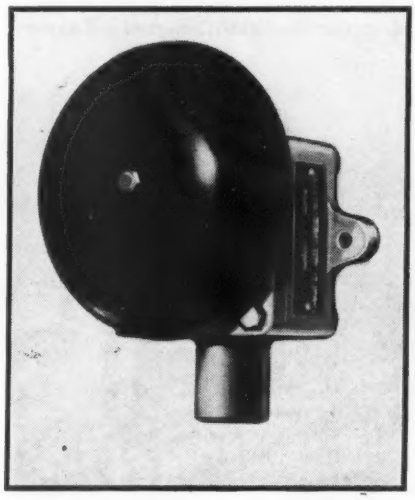


FIG. 5—*Crouse-Hinds explosion-proof bell.*

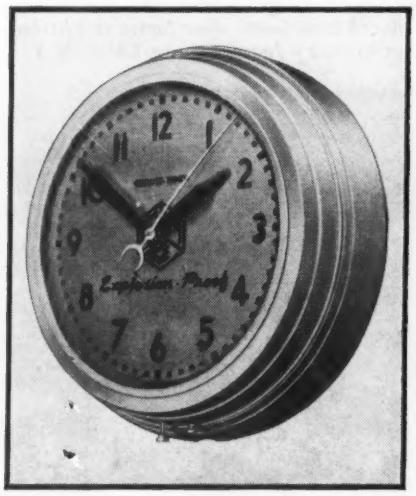


FIG. 6—*Crouse-Hinds explosion-proof synchronous motored clock.*

shaft of which passes through a long bushing to make the entire assembly explosion-proof.

This operating room station is designed for foot or elbow operation, and may be mounted in the wall approximately 18 inches or four feet from the floor for operation in the manner desired. When the plunger is pressed, lamps are lighted in the corridor over the doorway of the operating room, in the section nurses' annunciator, and in the diet kitchen and utility rooms. A buzzer operates continuously in the latter locations until the station is reset.

An auxiliary fire alarm station of the explosion-proof type is shown in Figure 3. This unit is approved under Class I, Groups C and D. It consists of a heavy cast three part outer housing to conform with the design of associated and standard fire alarm stations of the break-glass type. The heavy switch mechanisms is encased in a cast housing which is explosion-proof, which in turn is mounted to the second section of the outer case. The backbox of the outer case is drilled for three-quarter inch conduit.

This fire alarm station is designed for manual operation. Breaking of the glass on the front door releases the catch and the door opens. Pressing of the plunger actuates a remotely located electrically tripped transmitter, which in turn transmits a coded signal to all audible signal devices such as bells and horns throughout the entire fire alarm system. In addition, impulses may also be sent to the punch register for making a permanent record of the alarm. Stations of this type may also be used for operating special relay and emergency circuits.

An automatic thermostatic detector of the fixed temperature and rate-of-rise type is shown in Figure 4. This detector is approved under Class I, Group D and Class II Groups E, F and G. The standard unit is modified and is assembled in a cast metal enclosure provided with threaded outlets for rigid conduit connections. It is of the open-circuit type. On smooth ceilings or ceilings having large bays of smooth construction, each unit affords protection for an area not exceeding 900 square feet, or a space thirty feet square. Thermostats are spaced throughout the area so that they will be not more than 30 feet apart, and not more than 15 feet at right angles from any wall or partition extending to the ceiling.

A similar unit may be secured for fixed temperatures only which affords protection for an area not exceeding 156 square feet or twelve and one half feet square. They may be spaced throughout the area so that they will be not more than twelve and one-half feet apart and not more than six feet at right angles from any wall or partition extended to the ceiling. The space limitations mentioned in no way precludes closer placement of the devices where ceiling construction, fire drafts, and urgency for prompt alarms justify closer spacing. The fixed temperature in both types of units are pre-

(Continued on page 162)

FIG. 1—SPARKLING BRILLIANCE *of 200 footcandles in show windows is produced by 150-watt clear lamps in Pittsburgh silver mirrored glass louvered reflectors at Cramer's Jewelry Store, Utica, N. Y.*

FIG. 2—DIRECT INCANDESCENT LIGHT *from Holophane prismatic glass lens units (1) adds sparkle to jewelry in Michael's Jewelry Store, New Haven, Conn., while fluorescent cove lighting provides general illumination.*

FIG. 3—PRISMATIC LENS *Holophane unit (1 above) refracts sparkling light from point source clear filament lamp.*

FIG. 4—DECORATIVE COVE LIGHTING *supplements direct lighting from Guth recessed fluorescent troffers and in-*

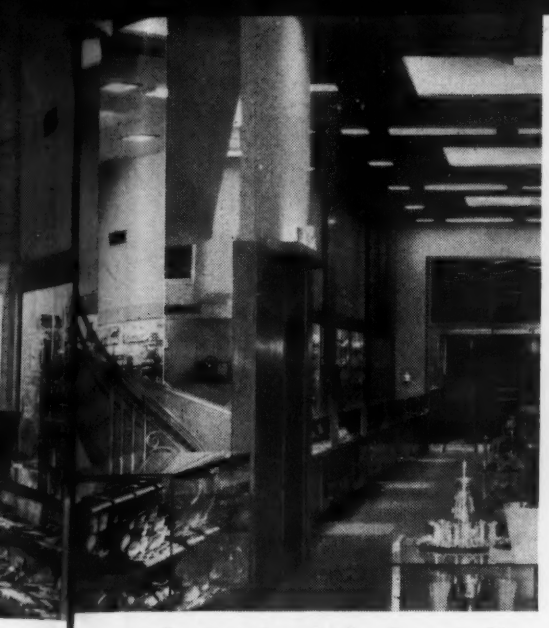
JEWELRY

By
Berlon C. Cooper

JEWELRY store lighting problems, in general, are the same as those for other types of stores. There is one major exception. By virtue of the type of merchandise displayed and sold, it is necessary to provide a type and quality of illumination which will add sparkle and glitter to the jewelry and glass displays, and which will give a diffuse illumination which is desirable for silverware, watches, ceramics and metal goods, leather products, stationery, and other merchandise of this nature. The average jewelry store carries a wide variety of merchandise, such as indicated above, and in many cases a general line of gift wares as well.

One of the first lighting problems encountered is that of show window lighting. The solution will depend to great extent on the type and size of show windows, and the type of displays which will be used. Show windows for jewelry stores vary greatly in size and type, from the small built-in-wall shallow wall case type to the full front show windows typical for the average store.

Regardless of size, however, the basic solution for window lighting in jewelry stores is to use clear filament lamps in efficient reflectors and spotlights to provide the desired sparkle, glitter and brilliance for jewelry of all types, and to supplement the incandescent lighting reflectors and spotlights with additional lighting units which will give a high intensity of general diffuse illumination over the entire window. Small diameter fluorescent lamps in specular reflectors are satisfactory for this purpose, and a current trend is to install these fluorescent lamps and their reflector equipment above a louver system which will provide 45-degree or greater shielding from all angles. Such louver systems should cover at least 50 percent of the



candescent prismatic glass lenses in Chas. S. Stifft & Co. jewelry store, Little Rock, Ark.

FIG. 5—HIGH INTENSITY *lighting is produced by recessed incandescent units at Wilson's, Rochester, N. Y.*

STORE LIGHTING TECHNIQUES

Direct light from clear filament lamps provides sparkle and brilliance on jewelry while indirect and diffuse light from fluorescent lamps provides atmosphere and decoration in the modern lighted jewelry store.

show window area. Show windows so equipped provide the displayman with full lighting flexibility which will permit him to select the type of lighting which is best suited for the various types of merchandise which will be displayed.

Jewelry displays should always be lighted by clear filament lamps; while displays of silverware, metal products, watches, etc., show up to best advantage when lighted by fluorescent lamps which provide a high degree of diffusion of light throughout the window display area. When jewelry and silverware, watches, etc. are all displayed in the same window at the same time, both filament and fluorescent lamps should be used. The displayman will use the spotlights for lighting feature displays and for creating dramatic effects for night time viewing.

Window displays are used to attract the attention of street traffic to the store. The lighting intensity in the show windows should therefore be bright enough to compete with all other brightly lighted areas in the vicinity of the store.

The problem of interior illumination is one of providing general lighting throughout the store, and of lighting the merchandise attractively so that it shows up to best advantage.

General illumination may be provided by any of the typical systems normally used for general lighting. These include indirect lighting from coves, coffers, domes, suspended or ceiling mounted luminaires, wall urns, or pedestals, or semi-indirect or general diffuse lighting from ceiling or suspension type luminaires, also direct lighting from diffuse type recessed troffers, individual luminaires or louvered ceilings.

Specific lighting for merchandise may take any of several forms. These include localized wall case and show case lighting, and the special lighting of jewelry counters and feature displays.

The purpose of show case lighting is, of course, to illuminate the merchandise in the cases and to thereby attract the attention of customers inside the store to the merchandise. The most satisfactory lighting for show cases is through the use of small slimline fluorescent lamps and small show case reflectors which obstruct the customer's view into the case as little as possible. This type of lighting is satisfactory even in the cases where jewelry is displayed, provided direct light from filament lamp reflector units are used overhead to light the same cases. Clear tubular filament lamps may also be used for show case lighting, but because of the low light output of these lamps and their inherent inefficiency, the color quality is yellow in appearance. A light of whiter color quality is desired for appraisal of diamonds and other precious and semi-precious stones. Also, excessive heat from filament lamps make them undesirable for show case lighting.

When merchandise is removed from show cases for customer inspection, it should be lighted effectively at the point of inspection. This is usually on top of the show case, or in individual customer booths. It is highly important that the illumination at this point be of the best quality possible, adequate in intensity for easy seeing, and sufficiently diffused to prevent sharp shadows. Direct lighting is desirable for the inspection of all gems and diamonds, or any type of jewelry that is judged by its sparkle and glitter. This direct lighting should further

FIG. 6—LOUVERED *vertical fluorescent units provide evenly diffused wall case lighting at Gorham Company's display room, Providence, R. I.*

FIG. 8—INCANDESCENT LAMPS *provide indirect general illumination and direct specific lighting in this ten year old Iowa store lighting job. The same lighting techniques would be used to light this store today except that fluorescent lamps would replace incandescent lamps for general lighting.*

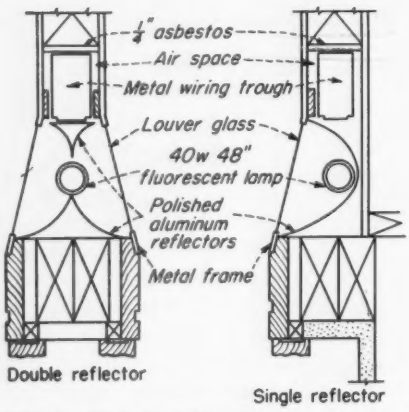


FIG. 7—WALL CASE *reflector units used in Gorham Company's display room are well shielded with Louverplas.*

come from point source filament lamps of the clear glass bulb type. Use of specular reflectors or prismatic glass lenses for controlling the light from these clear lamps will permit the sparkle to be maintained, by accurately controlling the point source of light from the filament. Daylight lamps which absorb some of the yellow radiation of filament lamps are recommended over the diamond counters, as they provide a whiter color quality of light for the accurate appraisal of the diamonds.

Direct lighting type units, used to produce the desired sparkle on gems and precious stones, should be well shielded to prevent annoying glare outside a 45-degree angle from the vertical. Use of concentrated type reflectors and concentric louvers, or prismatic glass lens units, will prevent this annoying direct glare from the overhead units.

The technique commonly used to provide proper lighting at the point of customer inspection of the merchandise in jewelry stores is to install incandescent reflector or lens type equipment over the front edge of the show cases. The equipment may be individual units installed on fairly close spacings, or continuous row units, and either recessed flush in the ceiling or suspended in an appropriate manner from the ceiling. The equipment should provide a semi-concentrating type of light distribution, in order to build up a high intensity of light at the point of inspection. Silver mirrored glass reflectors equipped with louvers to provide adequate shielding, or prismatic glass round or square lenses, are effective in controlling the light from clear lamps and in maintaining the desired quality of brilliance and sparkle.

Wall cases are most effective when lighted with an even diffusion of light throughout. The normal solution is to install fluorescent reflector strips along the inside of the wall cases at the top. This solution is effective, but can be improved considerably by installing louvered vertical reflectors designed for use with small diameter fluorescent lamps at wall case ends and dividing partitions.

Provision should be made for highlighting feature displays. Adjustable angle swivel spotlights, recessed at strategic locations in the ceiling, or incorporated with exposed luminaires, can be used for this purpose. Illuminated wall niches, using small fluorescent lamps or the new 75-watt reflector spot lamps, properly concealed within the niche, are also effective for small feature displays and add a decorative touch.

In providing general illumination throughout the store by means of coves, coffers, domes and other architectural treatments, light can be made to form a part of the decorative treatment at the same time. Lamps of proper color quality should be selected to complement the color treatment of the store interior, and care should be exercised to see that the color quality of the resultant illumination will at the same time light the merchandise most effectively. In general, daylight incandescent lamps are best suited for lighting jewelry displays to a fairly high intensity, and daylight fluorescent lamps are well suited for lighting silverware, either in wall or floor cases, or on open displays. The 4500-degree white and 3500-degree standard white fluorescent lamps are normally suitable for general lighting and for floor and wall case lighting.

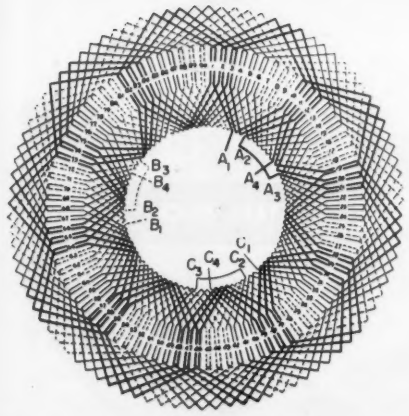


FIG. 1—*Complete winding diagram for a 3-phase, 90-slot, 10-pole wave wound rotor. Heavy lines indicate one phase.*

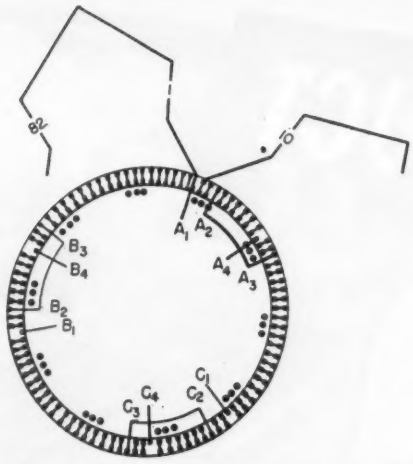


FIG. 2—*Test light check will show proper connections if light burns in sequence indicated by solid dot groups.*

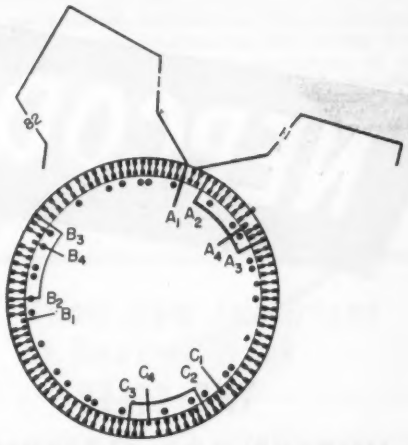


FIG. 3—*Erratic pattern of test light indicates wrong connection. Pattern should be in accordance with known grouping.*

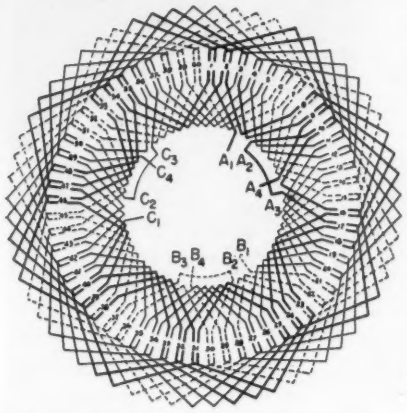


FIG. 4—*Complete winding diagram for a 3-phase, 60-slot, 8-pole wave-wound rotor.*

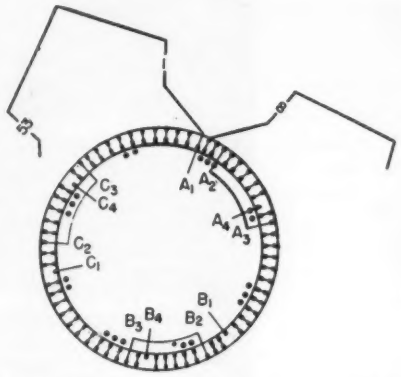


FIG. 5—*Three-two Sequence of test-light check (solid dots) for 60-slot, 8-pole rotor is in accordance with old grouping.*

Checking Wave-Wound Rotor Connections

By Chelso Gentilini

Electrical Engineer
National Electrical Coil Company
Columbus, Ohio

THE methods usually used to test for the proper connections of a lap winding cannot be used when checking the connections of a wave winding. Lap windings are normally used in stators and wave windings in rotors. One of the advantages of the wave winding is the elimination of the many group connectors which are necessary in a lap winding.

The number of group connectors per phase in a lap winding is equal to the number of poles, minus one. In the integral-slot and (integral + ½)-slot wave winding, there is only one connector per phase—the well-known reversing jumper — regardless of the number of poles. This is one of the reasons a wave winding is used in rotating apparatus.

A complete winding diagram for a 3-phase, 90-slot, 10-pole wave-wound rotor is shown in Fig. 1. The radial lines represent coils in the slots. The outer set of lines represents the end opposite the connection end of the coils, and the inner set represents the connection end. It can be seen that each phase has a reversing jumper in addition to the start and end leads. The start leads are connected to rings and the finish leads are connected together for a star connection or to the start leads of another phase for the delta connections. (In the figure, the phases are not connected for either star or delta but are left open). In Fig. 1, one phase has been printed with heavy lines. This phase has 10 groups of 3 coils per group. Each of the other two phases likewise has 10 groups, and 3 coils per minute.

When connecting the winding, the winder usually has a "start" position. After having established this "start" position, the sequence of number of clips is used. For example, let us assume in Fig. 1, the start position is fixed as follows: the bottom of slot No. 1 is lead A_1, and goes to a ring. At the back side, this coil goes to the top of slot No. 82, i.e., it spans 9 slot pitches or, as commonly known, spans 1 and 10. The bottom of slot No. 2 connects to top of slot No. 10. From this point on, the winder will connect the ends of the coils on the connection end as follows. going clockwise, he will connect the bottom of slot No. 3 with top of slot No. 11, thereby forming two series clips at the connection end. Next, there will be the top jumper lead A_2, followed by 6 series clips connecting 6 bottom coils with 6 top coils. The next bottom coil will be a lead (A_4), then 2 series clips, and a jumper connection to the next coil lead A_3. This is followed by 18 series clips, a lead (C_1), two series clips, a jumper (C_2), then 6 series clips, a lead (C_4), then two series clips, another jumper (C_3), etc. until all the coils are connected. This is shown schematically in Fig. 2.

If no error has been made, then a test light—with one end applied to A_1 and the other end free to contact every clip around the periphery of the rotor—will light in the sequence shown in Fig. 2 designated by solid dots occurring symmetrically in groups of

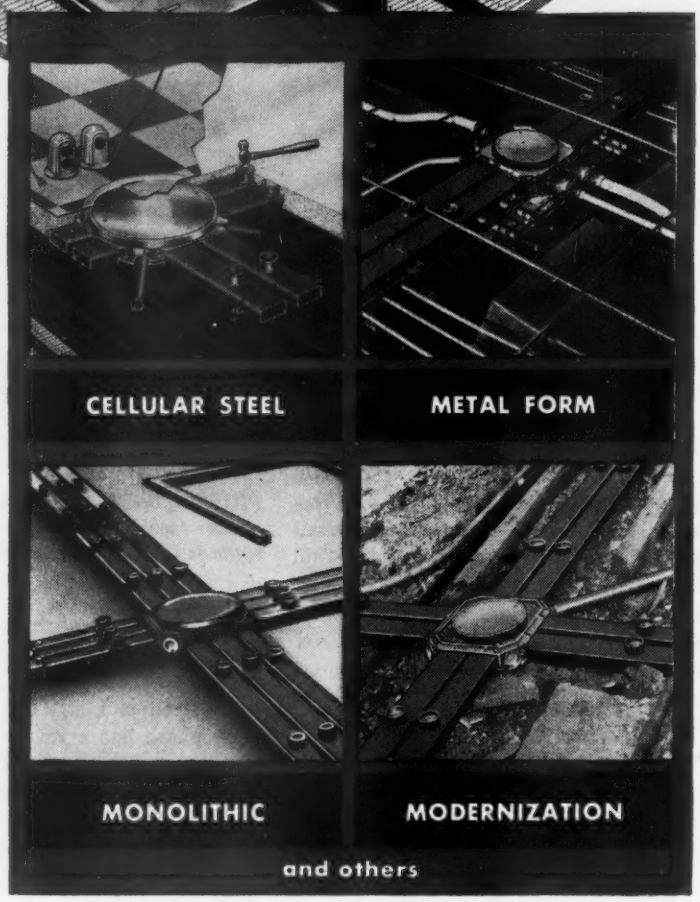
[Continued on page 161]

NEPCODUCT

THE STEEL UNDERFLOOR ELECTRICAL RACEWAY SYSTEM

FOR NEW CONSTRUCTION AND MODERNIZATION

Fits ANY TYPE of floor construction



PROVIDES CONVENIENCE OUTLETS AT THE FLOOR SURFACE

New junction box permits installing NEPCODUCT in the upper 2½" of concrete slab or *above steel deck construction.*

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- Eliminates cutting the permanent structure and boring through raceway to establish service connections.
- Reduces cost of electrical extensions and maintenance through easy accessibility to services in junction boxes and outlets.
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Practical Methods

Tool Trailer Speeds Jobs

TOOL HANDLING

Truck operating expenses are an important item in the cost of operating an electrical contracting business. It is a material and tool handling cost that varies with the type and size of the project and the distance of the job from the shop. Contractors who are organized for efficient operation attempt to reduce this cost to a practicable minimum.

The D. H. Kehne Electric Company of St. Paul, Minn., has been able to do this and still speed construction on their various projects. Their solution to the problem is a standard ½-ton two-wheeled trailer that can be hitched to either a large or small truck or, in an emergency, to one of the engineer's coupés.

Kehne added a large steel tool box to the top of the body and used the unit primarily as a tool trailer for street lighting and similar projects. Two slanting hinged covers, with hasp and padlocks, provide free access to the box interior. Secure mounting is provided by side extensions that fit into the stake-slots of the trailer body.

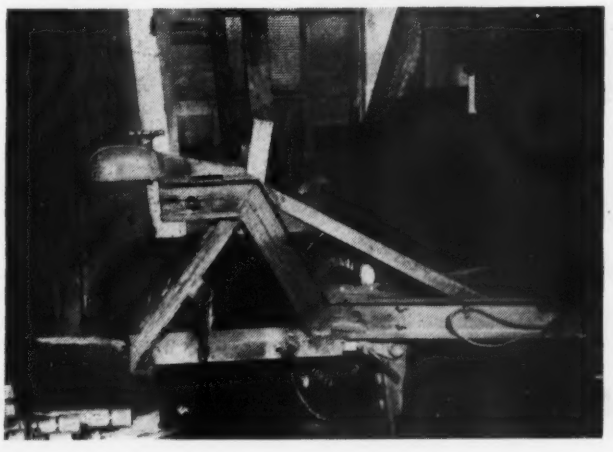
Miscellaneous materials and small tools (wrenches, cutting tools, pipe threading tools, saws, etc.) are placed in the tool box. Heavy stocks and dies, pipe benders, pipe pushers, shovels, torches and flares are placed in the trailer body under the tool box.

Biggest advantage of the unit is the fact that it can be left on the job and easily moved as the work progresses (as in street lighting underground conduit installations). It does not tie-up trucks than can be used for many other jobs.

The trailer can also be used on standard electrical construction work, particularly when specific tools and equipment must be rushed to jobs for underground service and foundation wall conduit installations.

A modified double-hitch on the trailer makes this possible. An upper level hitch fits the large trucks. When transferred to a lower bracket, the hitch fits the small trucks and passenger cars.

Tool box on wheels—Standard ½-ton trailer with steel tool box on top cuts truck operating costs for Kehne Electric Co. Trailer body (tailboard down) accommodates heavy benders, pipe pushers, shovels, etc.



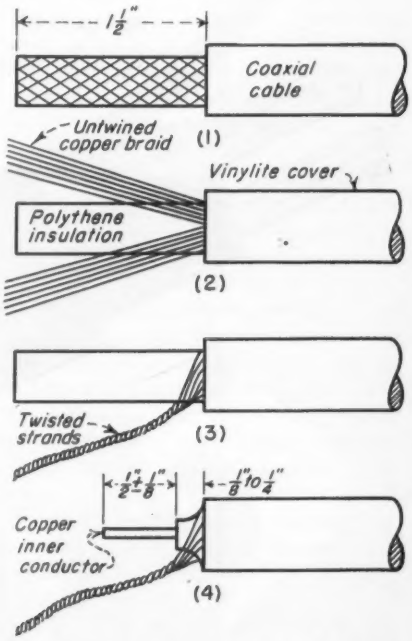
Double hitch arrangement on trailer. In top position (shown) hitch fits large trucks; when clamped to lower bracket, it fits small trucks and passenger cars.

Know-How Important In Coaxial Work

TELEVISION

Installing television antenna systems demands both technical know-how and careful workmanship. Based upon numerous installations completed by the Brown Electric Company of New York City, this statement by Moris Salit has the authority of experience. And "care" is definitely the keyword to an effective system, for cables must be carefully run, without sharp twists or bends; cable ends must be carefully cut and soldered, and conduit systems must be carefully designed to eliminate all unnecessary bends. Only when such care is taken will maximum reception be insured.

Stripping coaxial cables prior to making connections is a specific indication of this truth. Steps must be followed exactly or the job must be repeated. In making such a connection,



Connection of coaxial television cable is made by carefully removing 1½-inches of outside vinylite cover, untwining copper braid, twisting all of the strands together for a lead, and cutting excess polythene insulation and inner copper conductor to exact measurements.

TIREX
SELENIUM
Neoprene Armor
Unequalled for Long Life:
Resistance to
Abrasion
Flames
Oil

SYMBOL OF EXTRA-LONG CABLE LIFE

The Simplex-TIREX Selenium Neoprene emblem is a symbol of longer portable cord and cable life and more-dependable service for it stands for the exclusive Tirex jacket that is unsurpassed for resistance to the hazards of nature, and is **cured-in-lead** to provide unfailing protection against mechanical "wear and tear".

Crushing and twisting, sunlight and foul weather, oil, heat and flame all find Selenium Neoprene Armor more than their equal. And you will find it to be security against untimely breakdowns and low output whenever your portable electric apparatus is Tirex-equipped.

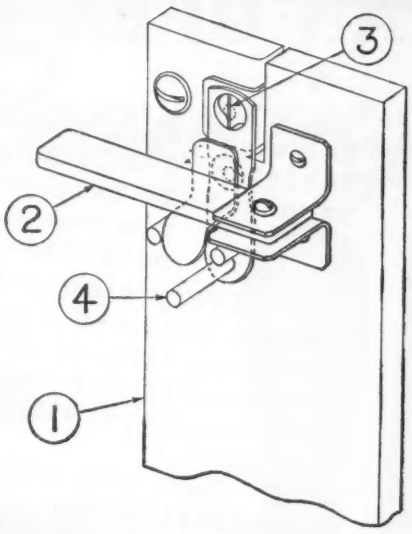
Selenium Neoprene Armor, **cured-in-lead,** is a feature of every TIREX Cord and Cable. TIREX is made in sizes and types to meet every requirement for use on all portable equipment. Ask the Simplex representative in your area to help you select those best suited to your needs.

Simplex-Tirex

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

first remove 1½-inches of the vinylite cover, being careful not to cut or nick the braid (1). With a sharp scriber, untwine the copper braid without cutting the polythene insulation (2). Then twist the unraveled strands of the braid into one straight lead, being careful to get *all* of the strands together without breakage (3). The polythene insulation is then cut off, leaving between ⅛ and ¼-inch, avoiding any nicks in the conductor. The inner conductor is then cut so that ½-inch, plus or minus an eighth, remains (4). Before proceeding, carefully inspect the cable to make sure that none of the braid strands cross the polythene, shorting the inner conductor. After this, the stripped cable is soldered to the terminal and, since polythene ***must not be heated,*** the inner conductor should be soldered as quickly as possible without bending the exposed polythene.

Final visual inspection is also important and, if the inner conductor has moved off center in the polythene, the job must be repeated. Only after final visual and ohmeter checks should the outlet box be closed. These checks are for correct circuiting, soldering of all joints, correct resistor values, continuity and short circuits. Following these checks, surface plates can be placed in position, closing the outlets.



New tool which aids in assembly of electrical clamps, developed and put in use by Glenn L. Martin Co., Baltimore, Md.

New Tool Aids Assembly

PRODUCTION

A solution to the slow and tedious job of assembling electrical clamps has been found in a new tool which holds the parts together in perfect alignment, developed at The Glenn L. Martin Company, Baltimore, Maryland.

Before this time it had been necessary to use hand tools to tighten the screws and nuts which held the parts together. This procedure often resulted in the parts getting out of alignment and a great many crooked clamps which had to be loosened, realigned and retightened, causing an additional loss of time.

With the new tool all such errors are eliminated and in addition it makes possible the use of a compressed air nut runner for faster assembly.

The base of the tool (1, in illustration) is made of fiber board and when the tool is in operation is placed in a vise. The parts are held by a slot in the base and a series of three pins (4), while the fibre arm (2) is held down on the clamp keeping constant pressure on the screw which joins the two parts.

When the nut is turned, the head of the screw is automatically forced onto the "built-in" screwdriver (3), holding it until the nut is tight.

With slight modifications, tools of this type could be made adaptable to assembling other types of clamps, which not only save considerable time in assembly but also improve the quality of the workmanship. Such tools are especially useful when small parts which may get out of alignment during assembly are involved.

Plug-in strips mounted in tops and along edges of testing benches in main plant of Burroughs Adding Machine Company provide multi-voltage service for testing office equipment prior to final approval and shipment.

Plug-In Strips Give Multi-Voltage Service

DISTRIBUTION

A new method for distributing power of various voltages to test and adjustment benches is being used extensively in many departments throughout the main plant of the Burroughs Adding Machine Company in Detroit. For more than 15 miles of Plug-In Strip, manufactured by the National Electric Products Corporation of Pittsburgh, has been mounted on the sides or recessed into the top surfaces of work benches. Along the rear of each bench, just beneath the edge, four runs of multi-outlet branch circuit assemblies have been mounted. On these four circuits are carried 110-volt a-c, 220-volt a-c and two special currents. Convenience receptacles are spaced every 18 inches.

Spanning the 3-foot width of the benches and set flush with their tops, nine triple sets of Plug-In strip, each with five electrical outlets, are plainly stencilled to indicate the voltages connected. Factory-wired into the steel channels at 6- and 8-inch intervals, these convenient wiring runs provide service for testing the complete Burrough's line of bookkeeping, accounting, calculating and statistical machines prior to their shipment from the factory.

AN OPEN LETTER

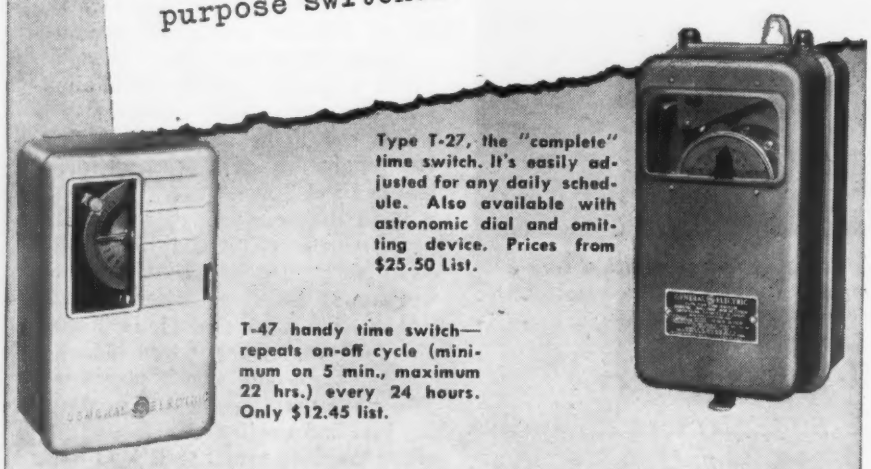
To: Electrical Contractors
Subject: G-E Time Switches
Purpose: To help you make greater profits and give more customer satisfaction

Every time you convince your customers that G-E time switches are needed for a particular job, both of you benefit—profit for yourself, convenience and lower operating costs for your customer.

Have you considered all these possibilities?

—safety lighting in that new factory you're working on,
—window lighting in that new store,
—corridor and stair-well lighting in new apartment houses,
—heater and cooling control in any public buildings,
—conveyor, fan, solder-pot, or oven control in factories.

There's a G-E time switch for each of these jobs, and many others. Here are two versatile, general-purpose switches:



Type T-27, the "complete" time switch. It's easily adjusted for any daily schedule. Also available with astronomic dial and omitting device. Prices from $25.50 List.

T-47 handy time switch—repeats on-off cycle (minimum on 5 min., maximum 22 hrs.) every 24 hours. Only $12.45 list.

LONG-RANGE CUSTOMER SATISFACTION assured by large silver contacts and reliable Telechron ® motors in both these switches.

INSTALLATION MADE EASY by roomy wiring space and simple knockouts.

For more information on your particular application of these, or any other G-E time switches, see your dealer or nearby G-E sales engineer. Write today for Bulletin GEA-3339 (T-27), GEA-4874 (T-47). *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

602-76

Finger tip control of G. E. Tri-Clad type ACA adjustable speed motor materially increases rate of canning in Ruppert Brewery, saves wasted beer and damaged cans due to jams, facilitates washing and reduces motor maintenance.

Adjustable Speed Motor Ups Beer Canning Rate

INDUSTRIAL

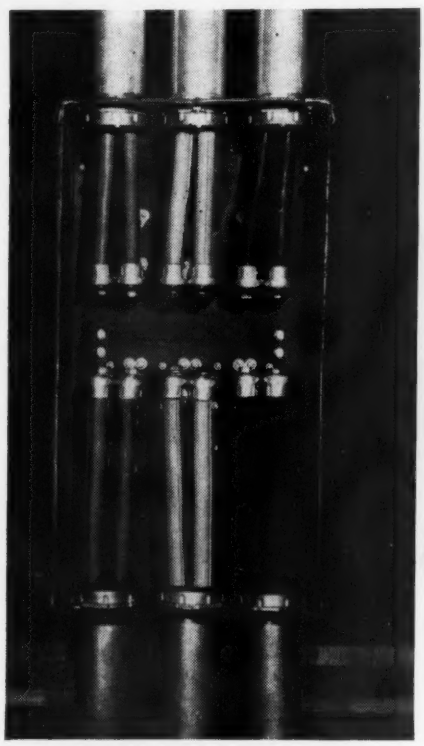
The production bottleneck at the Jacob Ruppert Brewery in New York City formerly was the filling and closing operation which was necessary in canning beer. But the installation of a G. E. Tri-Clad type ACA adjustable speed motor now operates a new high-speed filling and closing unit and the output of canned beer is being materially stepped up without any sacrifice of previous controls or production safety factors.

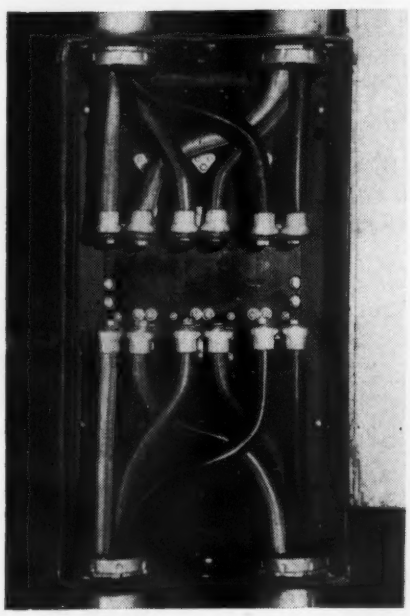
According to the Continental Can Company, designers of the new closing unit, the motor is the first of its kind, and the 3-to-1 stepless adjustable operating speed enables the brewer to vary his output of cans in accordance with production demands, from 105 to 315 cans per minute. Previous drives for this type of equipment usually consisted of motors with only fixed operating speeds or motors with two speeds with belt speed-changing devices, which resulted in numerous maintenance headaches.

An air cylinder, used in conjunction with a hydraulic clutch, provides a braking system on this new unit, enabling it to stop production within two can-widths and the line can be halted from maximum speed to a complete stop within a ½-second, representing a considerable saving in damaged cans and wasted beer in case of a jam.

The work of the operator has also been reduced by this installation. In making speed changes, it was formerly necessary to change motor speeds by manually adjusting the belt speed-

changing device. Now the unit is controlled by finger tip dials which permit instant changes to any desired speed. According to past experience of plant engineers, the most efficient method for cleaning units is to wash them while running at their slowest speed. Here again the finger tip dial represents a saving in time.





No cable cross-overs are necessary at terminal points when non-magnetic conduits are used on three-phase circuits with parallel conductors. Photo at top shows straight-line connections at back of circuit breaker with aluminum raceways where each conduit contains a separate phase. Photo at bottom illustrates technique required with magnetic raceways where each conduit must contain one leg of all phase conductors.

QUICK *Pipe Reaming* THAT SAVES PIPE

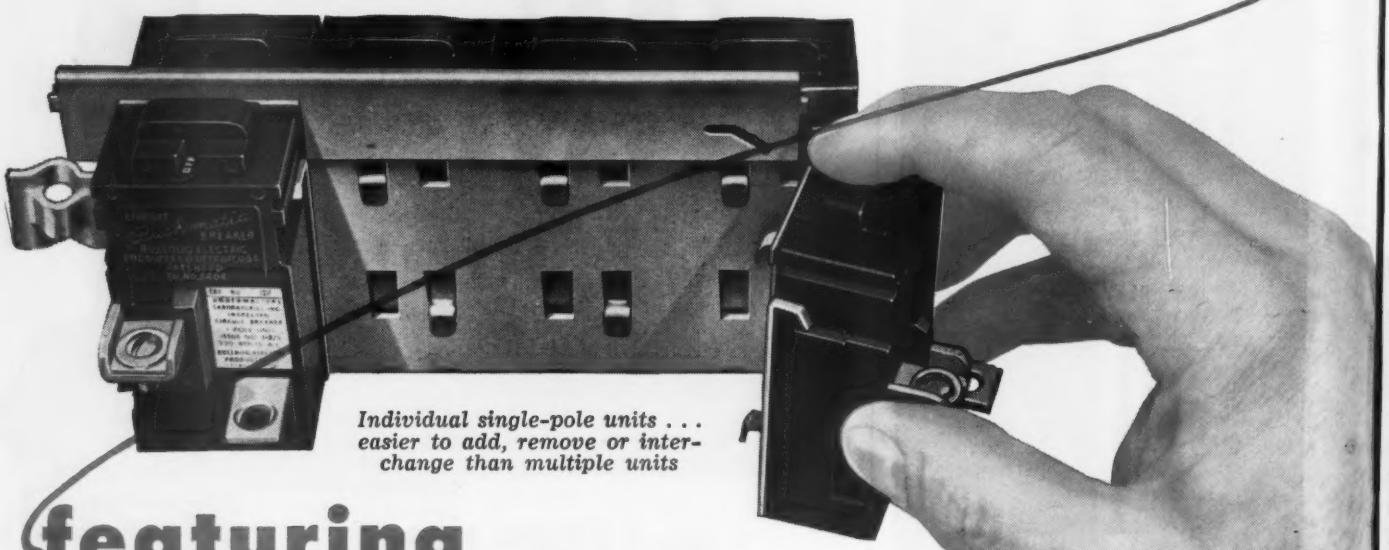
RIDGID
Extra-Long-Taper Reamer won't thin, flare or split pipe

● Secret of the RIDGID's safe easy reaming is its extra long taper. With a few light ratchet turns, you whisk the burr from pipe or conduit without fear of thinning, flaring or splitting. You save time, work *and* pipe. Two sizes: No. 2, ⅛" to 2"; No. 3, ⅜" to 3." No. 2 reamer unit available without ratchet handle for use in RIDGID No. 00R threader handle. Ask your Supply House.

Reamer unit fits RIDGID No. 00R Ratchet Handle.

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL CO. • ELYRIA, OHIO

ANNOUNCING *Pushmatic*



Individual single-pole units . . . easier to add, remove or interchange than multiple units

featuring

PUSH-BUTTON CONTROL and AUTOMATIC PROTECTION for ELECTRIC CIRCUITS

NOW BULLDOG'S revolutionary, new *Pushmatic* gives you *positive* finger-tip control and *automatic protection* against overload and short circuits!

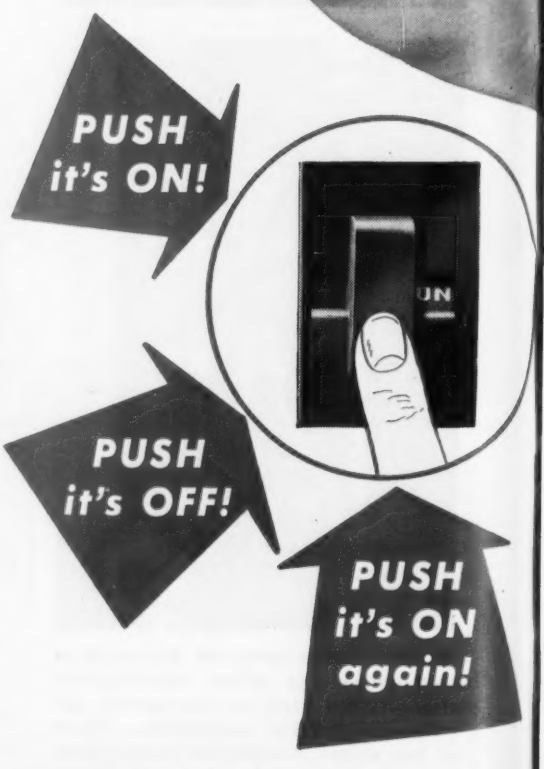
A push of the finger makes or breaks the circuit. There's no resetting manually when the circuit is broken by short or overload. Just PUSH—and service is restored.

Pushmatic is compact, sturdy, simple . . . the most versatile and flexible unit available today. It will meet *every* new or changing load condition.

And *Pushmatics* are easy to install. There are no complicated group mountings . . . individual single-pole units make additions and changes a simple matter.

There are four types of *Pushmatics:* THERMAL ONLY, THERMAL MAGNETIC, or either of these types with AMBIENT COMPENSATING FEATURES. All are identical in size and contour, in ratings of 15, 20, 30, 40 and 50 amperes, 120 V., 1 pole, or 120-240 V., 2 poles, AC. All are interchangeable for rating and type.

Find out about *Pushmatic's* outstanding features before you specify or buy any circuit breaker.



DON'T BUY UNTIL YOU HAVE SEEN THE LA

BullDog Electri-Centers with *Pushmatic*

NEW, BEAUTIFULLY STYLED LINE OF PROTECTIVE CONTROL CENTERS

THESE sensational, new ELECTRI-CENTERS, featuring *Pushmatic*, provide electrical control centers that are the last word in efficiency and protection.

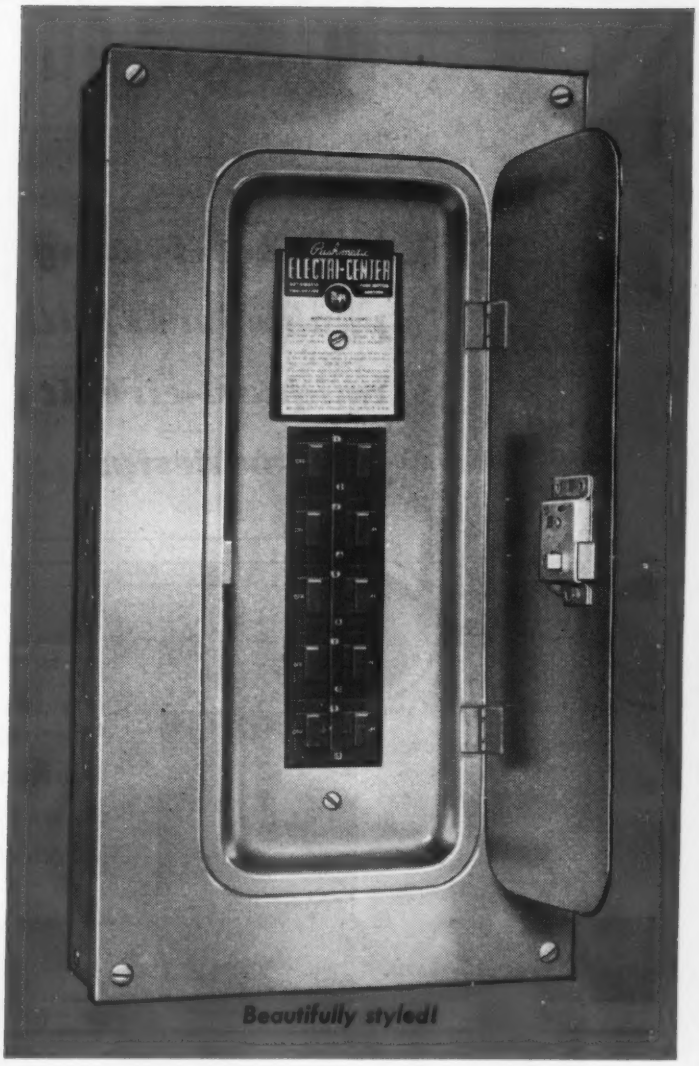
They are attractive, compact, simple . . . easy to wire. There's plenty of gutter room even in the smallest cabinets.

With ELECTRI-CENTERS there are no fuses to buy, no complicated operations or installation techniques to remember. You get versatility and adaptability, ease of installation and operation *never before obtainable in any panelboard.*

See the new ELECTRI-CENTERS at first opportunity, or send in the coupon today for *Pushmatic* Bulletin #493. This descriptive bulletin, liberally illustrated, contains complete information and prices on BullDog ELECTRI-CENTERS and the new *Pushmatics.*

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO



Beautifully styled!

Check these NEW Features

- **Positive protection against overloads and short circuits**
- **Push "ON" and "OFF" for normal manual switching. Push "ON" after automatic tripping—no so-called reset position**
- **Trip-free of the handle**
- **All types and ratings interchangeable, quickly, easily**
- **Permanent calibration by amperes in one precision-formed part**

Functionally perfect!

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

LATEST AND FINEST

BULLDOG ELECTRIC PRODUCTS CO.
Detroit 32, Michigan

Please send me your *Pushmatic* Bulletin #493 giving full information and prices on your *Pushmatic* ELECTRI-CENTERS.

Name_____

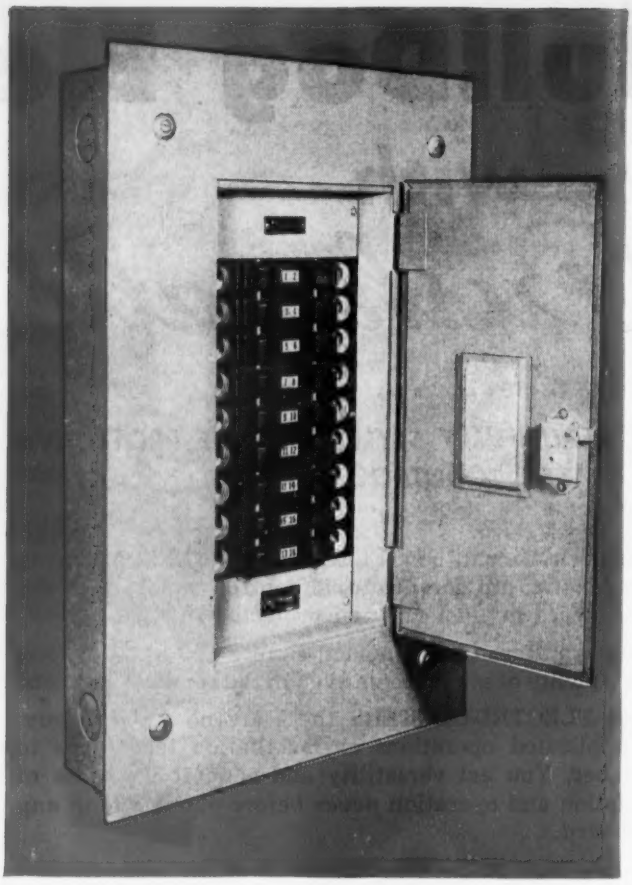
Company_____

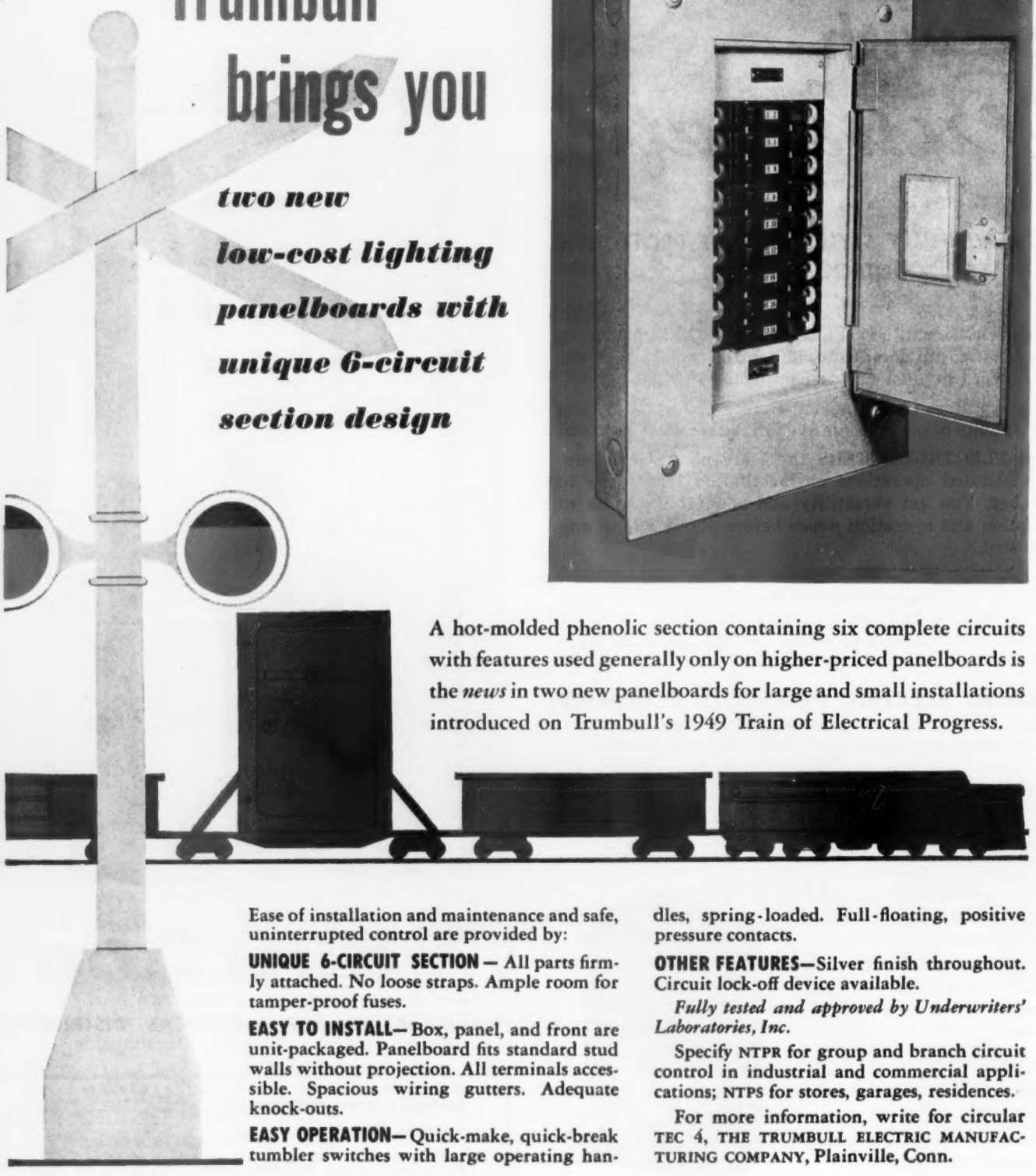
Street Address_____ Zone_____

City and State_____

Trumbull brings you

two new low-cost lighting panelboards with unique 6-circuit section design





A hot-molded phenolic section containing six complete circuits with features used generally only on higher-priced panelboards is the *news* in two new panelboards for large and small installations introduced on Trumbull's 1949 Train of Electrical Progress.

Ease of installation and maintenance and safe, uninterrupted control are provided by:

UNIQUE 6-CIRCUIT SECTION — All parts firmly attached. No loose straps. Ample room for tamper-proof fuses.

EASY TO INSTALL— Box, panel, and front are unit-packaged. Panelboard fits standard stud walls without projection. All terminals accessible. Spacious wiring gutters. Adequate knock-outs.

EASY OPERATION— Quick-make, quick-break tumbler switches with large operating handles, spring-loaded. Full-floating, positive pressure contacts.

OTHER FEATURES—Silver finish throughout. Circuit lock-off device available.

Fully tested and approved by Underwriters' Laboratories, Inc.

Specify NTPR for group and branch circuit control in industrial and commercial applications; NTPS for stores, garages, residences.

For more information, write for circular TEC 4, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC

TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

Motor Shops

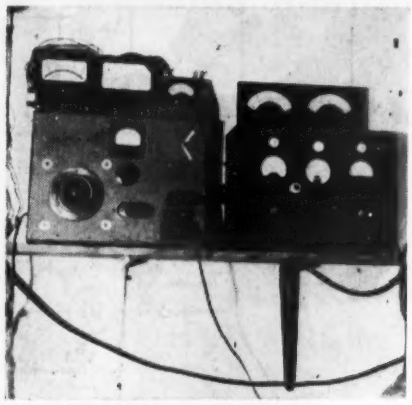


FIG. 1—Single phase tester.

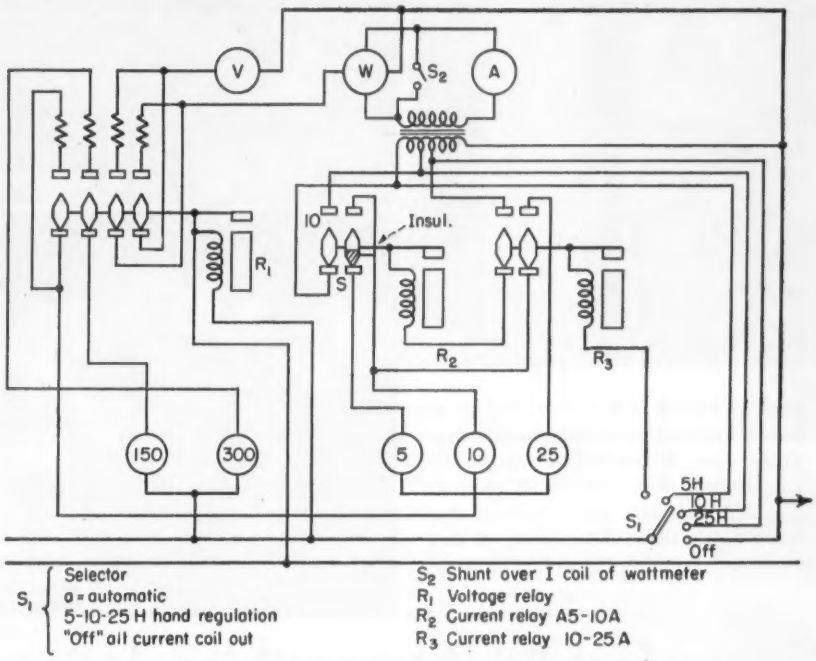


FIG. 2—Circuit of single phase tester.

Useful Motor Testers

By Andrew Bekey

Motors are frequently received with nameplates missing, and your suspicions are aroused that the winding may not be correct at all. Since you have no winding specifications on file, it is necessary to make a performance test in order to know how the motor will stand up and perform, before going ahead to design a new winding, if a change of design is necessary.

Sometimes the motor you receive has already been rewound several times in other shops, undergoing slight changes in each. A 10 percent change in the winding is usually permissable, but several successive changes of that kind, if they be cumulative, may destroy the torque and power, or in the other extreme may increase the density over the bend of the magnetization curve so far that the core loss, magnetizating current and heating are excessive.

The motor analyzer shown by Fig. 1 and the corresponding circuit diagram, in Fig. 2 can give the answer in a short time. It consists of a voltmeter, a wattmeter and an ammeter, so interlocked electrically that the current you draw, or the voltage at which you operate, automatically connects the corresponding ranges of the instruments.

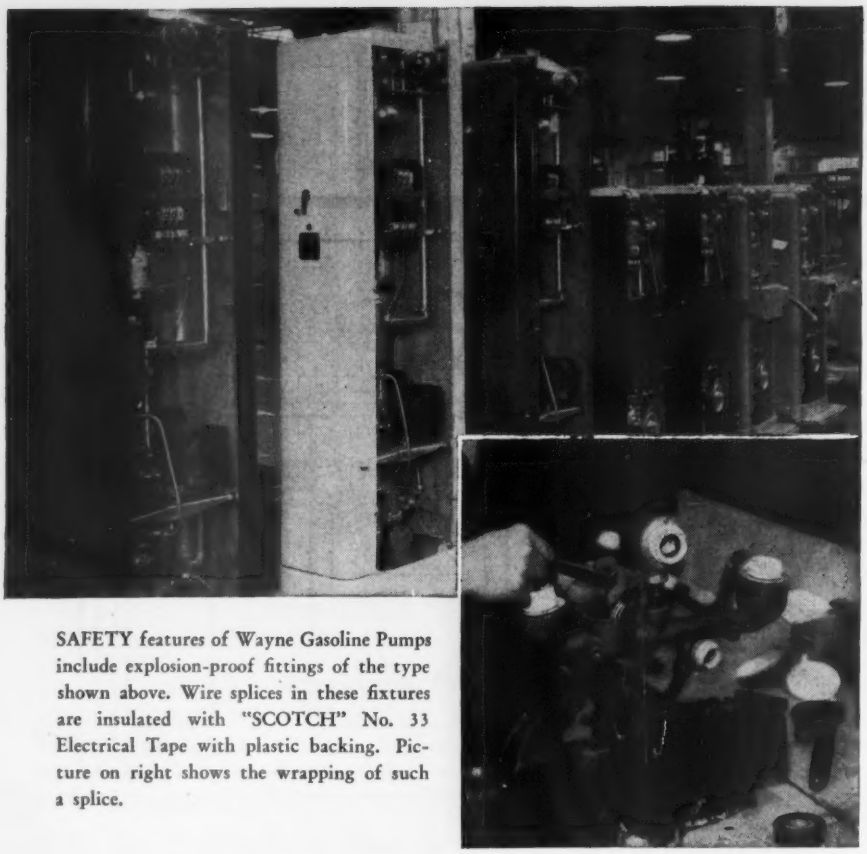
There are multiplier resistances for the voltmeter and the voltage coil of the wattmeter, also different taps for the corresponding ranges of the current coil of the wattmeter, and the ammeter, from the transformer. A relay, operating on voltage, closes at 140 volts and connects a signal lamp indicating that the 220 volt range is on, and volt and wattmeter have double readings. The same relay connects multiplier resistance before the volt and wattmeter coils, and inserts resistances before any signal lamp which can be connected.

FIG. 3—Insulation tester.

The other relays are in series, so connected that the current drawn by the motor, trips them successively at 5 and 10 amperes, connecting the corresponding ranges of the current transformer for the 5, 10, and 25 ampere ranges of the instruments. A signal lamp corresponds to each position, so that the reading can be multiplied fast. The minimum reading is 110 volts, 0.5 ampere and 50 watts. The maximum is 220 volts, 25 amperes and 2750 watts.

For convenience, there is a switch over the current coil and a manual setting of the current transformer disconnecting the relays.

By adding to this tester a brake and



SAFETY features of Wayne Gasoline Pumps include explosion-proof fittings of the type shown above. Wire splices in these fixtures are insulated with "SCOTCH" No. 33 Electrical Tape with plastic backing. Picture on right shows the wrapping of such a splice.

Get perfect "tight spot" insulation with this tape

All splices of electric wiring in explosion-proof fittings on Wayne gasoline pumps are made with tough, impervious, plastic-backed "SCOTCH" No. 33 Electrical Tape. The thinness of this tape together with its high dielectric and mechanical strength makes it ideal for insulating splices in tight quarters in a one-tape-one-operation job.

Write Dept. EC-6 for sample and booklet.

QUICK FACTS ABOUT
"SCOTCH" No. 33 Electrical Tape

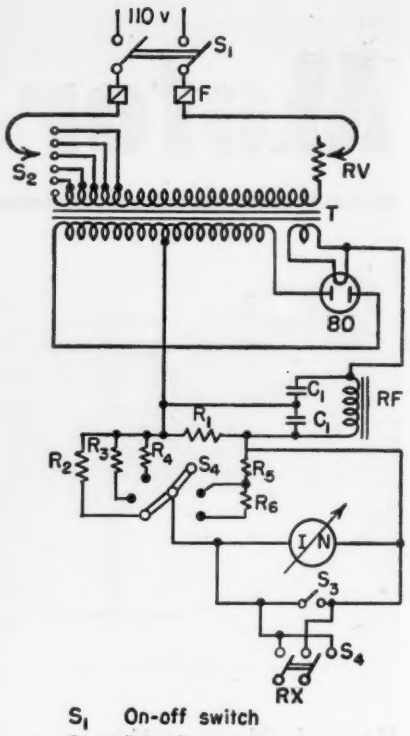
- *Thin caliper*—only .007 inch thick, takes less room in junction boxes, conduits, fittings.
- *High dielectric strength*—over 7,000 volts.
- *Tough*—plastic backing is abrasion resistant, unaffected by water, acids, alkalies, alcohols.
- *Stretchy*—conforms snugly to uneven surfaces.

SCOTCH BRAND
No. 33 Electrical Tape

Made in U. S. A. by
MINNESOTA MINING & MFG. CO.
St. Paul 6, Minnesota

3M COMPANY

General Export: DUREX ABRASIVES CORP., New Rochelle, N. Y.
In Canada: CANADIAN DUREX ABRASIVES LTD., Brantford, Ontario



S_1	On-off switch
S_2	Primary tap change
S_3	Zero adjusting
S_4	Polarity changer
F	Fuses
RF	Reactance filter choke
C_1 C_2	Filter condensers
RV	Variable resistor
RX	Unknown resistance

FIG. 4—Circuit of insulation tester.

a tachometer, you can check the performance of any single phase motor up to 5 hp.

The second tester, shown in Fig. 3 and corresponding circuit diagram in Fig. 4 is an ohmmeter for a maximum of 1000 megohms, for three ranges of 1000, 100 and 10 megohms maximum, operating from the line and testing with 500 volts d-c. The current is 50 microamps.

The diagram is self-explanatory. From the line, the current goes to a tapped transformer to adjust for the variation of the line voltage. After a full wave rectifier, the current is filtered and a bleeder resistance inserted to draw a current several times higher than that of the instrument; that is, so as not to affect the voltage by the additional drop of instrument current.

There is a switch to reverse the polarity of the test leads and another to short them for a zero setting, and a potentiometer for fine adjustment.

Simple Bar Aligns Slot Laminations

Practically every motor repair shop has had occasion to straighten stator slot laminations that had been dragged over or out of alignment due to bearing

Quik Quiz on CONDULETS

Questions and answers
regarding the backbone of an electrical wiring installation

Type C
Obround Condulet
Broken-away view showing (1) tapered threads, and (2) the Wedgenut fastener

Question. When were CONDULETS first made?

Answer. In 1906 Crouse-Hinds Company introduced CONDULETS to the electrical wiring industry. CONDULETS represented an entirely new idea in conduit outlets, totally unlike the outlet boxes and fittings previously made. CONDULETS were destined to revolutionize electrical conduit installation practice.

Q. How did the word "CONDULET" originate?

A. Crouse-Hinds new conduit outlets needed a name so the word "CONDULET" was coined, a contraction of "conduit" and "outlet." It is registered in the U. S. Patent Office and designates a product made only by the Crouse-Hinds Company.

Q. What were the advantages of CONDULETS over previous outlets?

A. The older outlets were both unhandy and unsightly, while the new cast CONDULETS were streamlined, compact outlets that were handy to install and produced a neat appearing job. The oblong body with round ends suggested the name "Obround", which was applied to the first series of CONDULETS.

Q. Were they like the present Obround CONDULET?

A. There have been important refinements, but the basic design remains the same. The most notable improvement was the Crouse-Hinds Wedgenut fastener which provides a handy way to firmly attach the covers.

Q. How many types are now in the Obround Series?

A. Forty-nine types. Sizes to fit ⅛" to 6" conduits, with a wide selection of interchangeable covers and wiring devices.

Q. What other CONDULETS have been added to the line?

A. Obround CONDULETS were so well received by the electrical trade that a variety of other types followed in rapid succession. In fact, the CONDULET line has grown far beyond the original concept and now includes, besides the items needed for the usual conduit installations, a complete line of explosion-proof and dust-tight CONDULETS for use in industries where explosive gases or dust require special electrical safeguards.

Q. Why are all the threads in CONDULET hubs taper tapped?

A. Because all conduit threads are tapered and it makes an imperfect job if a tapered thread is screwed into a straight threaded hole. When using CONDULETS, the threads on the conduit firmly engage every thread in the hub, because both are tapered. This makes a rigid joint which will not loosen under vibration and also assures permanent ground continuity. Taper tapping is an important Crouse-Hinds feature.

Q. What about CONDULET quality?

A. CONDULETS have always been noted for the highest quality. They are scientifically designed in Crouse-Hinds Engineering Department and carefully manufactured in a modern factory by skilled craftsmen from the finest material obtainable. Crouse-Hinds operates four separate laboratories where trained technicians assist in the development of new products and maintain a constant control over the quality of CONDULETS.

Q. How many CONDULETS are there today?

A. More than 15,000 items constitute the present CONDULET line. Conduit installations in all parts of the world are equipped with CONDULETS.

Q. WHERE CAN I BUY CONDULETS?

A. From the beginning it has been the Crouse-Hinds policy to have . . . **A Nationwide Distribution through Electrical Wholesalers.** There is one near you.

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

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IRVINGTON'S #100 clear #500 black INSULATING VARNISH

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Here are varnishes that remain tough, flexible and stable under the most rugged operating conditions . . . retain high dielectric strength at high temperatures. They penetrate deeply, dry from the inside, bind coil windings into a unit acting mass preventing movement of wires . . . resist damaging heat, moisture, oil, acids, alkalies; and will not attack enamel coating on magnet wire.

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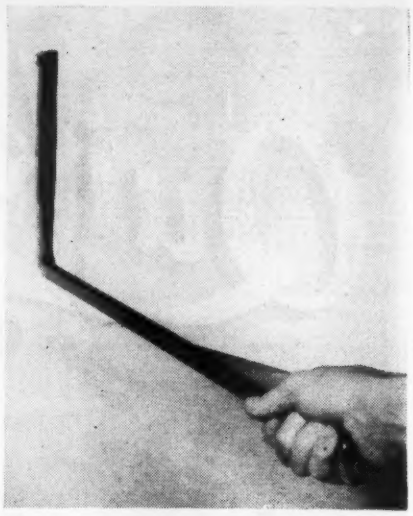
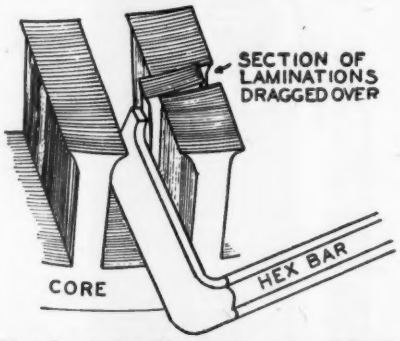


Bent hex bar of high quality steel, flattened and ground to provide protruding end, comprises the simple tool.



Sketch of slot illustrating use of lamination straightening tool.

When using tool, left hand guides bar in slot while right hand applies twisting pressure at end of hex handle.

failure or excessive bearing wear. A fairly safe assumption is that most shops do this chore by placing a blunt chisel or screw driver against the protruding laminations to drive them back into place. Biggest disadvantage of this practice is that sharp blows on the lamination usually flatten it; produce a rough slot that damages insulation, makes wedge driving difficult.

A simple tool, designed by Albert C. Hanson of the Sullivan Electric Company, Cincinnati, Ohio, provides the answer to this shop problem. Hanson's idea was awarded first prize in the 1948 NISA Award Contest and is released for publication through the courtesy of the 1948 Award Contest Committee.

The tool is made from a length of high quality steel hex bar (ordinary machine steel will not stand twisting stresses). One end is flattened and bent into a 90 degree offset. The flat portion is then ground down to provide a half-inch wide hardened steel projection at the end.

When used, the flat portion of the bar is inserted in the slot as shown in the accompanying diagram. The end projection is pressed against the laminations which are forced back into line by applying pressure on the hex handle of the tool. This method applies pressure on the straight sides of the laminations rather than on the sharp corners of the "tooth" and results in a smoother job than can be done by pounding individual laminations. A half-inch block of laminations can be straightened at a time. The bar is then moved to the next section that requires alignment. A complete set of tools can be inexpensively made for use on various size motors. Sullivan Electric plans to market the tools if there is sufficient demand for it. It has also been found that, since the tool is prevented from slippage by its position inside the slot, the danger of injured fingers is removed, as is the possibility of damaging the stator.

Officers of the Electrical Maintenance Engineers of Greater Kansas City are: (L to R) President—John H. Masters, electrical engineer, Colgate-Palmolive Peet Co., Kansas City, Kansas; and vice-president—Leonard L. McClenahan, maintenance electrician, General Motors B-O-P Plant, Kansas City, Kansas.

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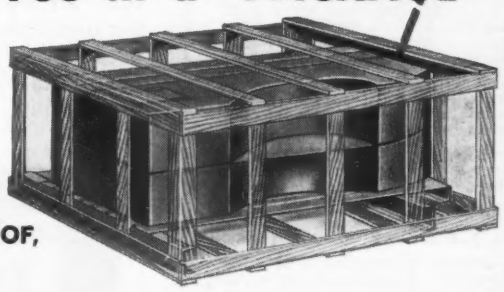

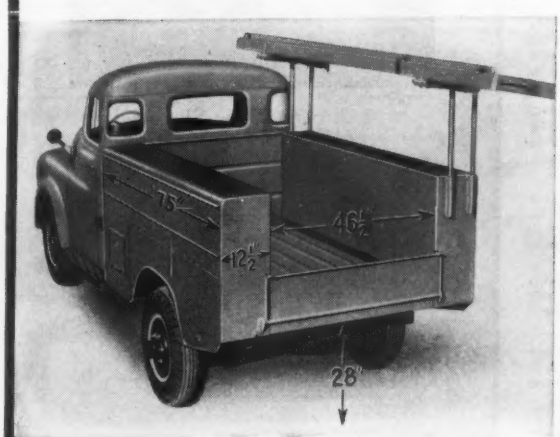

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2. Benjamin "Twin-Flo" Fluorescent Lighting at Bemis Bros., Omaha, 45 ft-c av. intensity, by John Sinovich, Evans Electrical Constr. Co., Omaha.
3. Benjamin Floodlights & Pit Lights at Lever Bros.' New Office Bldg., Cambridge, Mass., 70 Footlamberts by P. D. Dempsey, Geo. H. Wahn Co., Boston, Mass.

4, 5, 6, 7, 8, Benjamin "Sky-Glo" Lighting

4. at a mens' clothing store, Winston-Salem, N.C. Footlamberts per sq. in., Ceiling: 67; Walls: 3.17; Floors: 4.09; by Edgar A. Fargis, Noland Co., Inc., Winston-Salem, N.C.
5. at Peoples City Bank, McKeesport, Pa. ft-c at 30" above floor: Banking area 45; Teller's 60; by Hugh S. James and John B. Martin, Duquesne Light Co., Pittsburgh, Pa.
6. at Mueller Harkins Automotive Sales, Tacoma, Wash. 76 ft-c at 30" above floor; by R. H. Fewell, Westinghouse Elect. Supply Co. and B. L. Payson, Wire Electric Co., Tacoma, Wash.
7. at Central Trust Co., Rochester, New York, a Gold Seal Merit Award to R. Bruce Thompson, General Electric Supply Corporation, A. G. Alexander, New York City, Consulting Architect, T. H. Greene Electric Co., Rochester, Electrical Contractor. Average Footcandles in Public Area 90 Footcandles!
8. at Thompson Store for Men, Downers Grove, Ill. av. ft-c 66 by Donnie Howell, Downers Grove Elect. Co. and Paul Fisher, Western United Gas & Elect. Co.

Send for Bulletin AD5579 — Contains a Representative List of Benjamin "Sky-Glo" Installations arranged by States and Cities.

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ENGINEERING • INSTALLATION • MAINTENANCE

Electrical Maintenance of Overhead Cranes and Conveyors

Some pertinent observations on the selection and maintenance of electrical equipment on material handling operations.

By C. B. Risler
Industrial Engineering Department
Westinghouse Electric Corporation
East Pittsburgh, Pa.

WITH the introduction of mechanized material handling into plants, it assumes its place in the production line just as much as any automatic production machine or equipment. Shutdown of the material handling equipment will stop production just as "dead" as would the breakdown of any machine or apparatus in the mass-production set-up.

The effect of production stoppages on operating economy, production records, maintenance of shipping schedules and overall efficiency is well known to every plant man. Add to this, in the face of present shortages of certain metals and alloys, the need to conserve present machinery to obtain the utmost in longevity and performance, and you have more than ample justification for developing a program to avoid equipment breakdown and make necessary repairs during convenient idle machine time. It all adds up to good management both from the standpoint of individual businesses and the broader aspect of national economy.

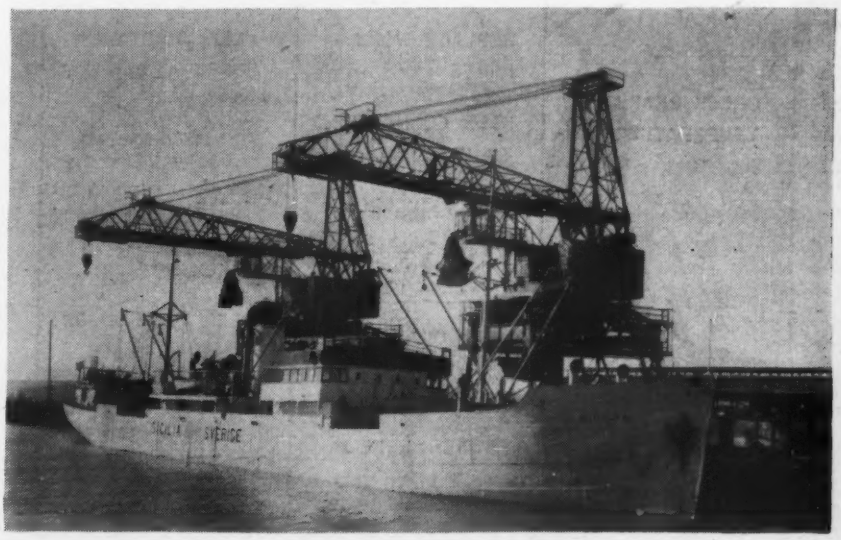
The key to the whole problem is a Preventive Maintenance System, a program that consists of checking all possible trouble spots before trouble has a chance to break loose. Applied to electrical equipment for material handling apparatus it is merely a practice of checking:

- Motor bearings
- Insulation
- Lubrication
- Controls for contactor tip wear
- Relay adjustments
- Resistors for loose connections
- Cleanliness of all apparatus and parts.

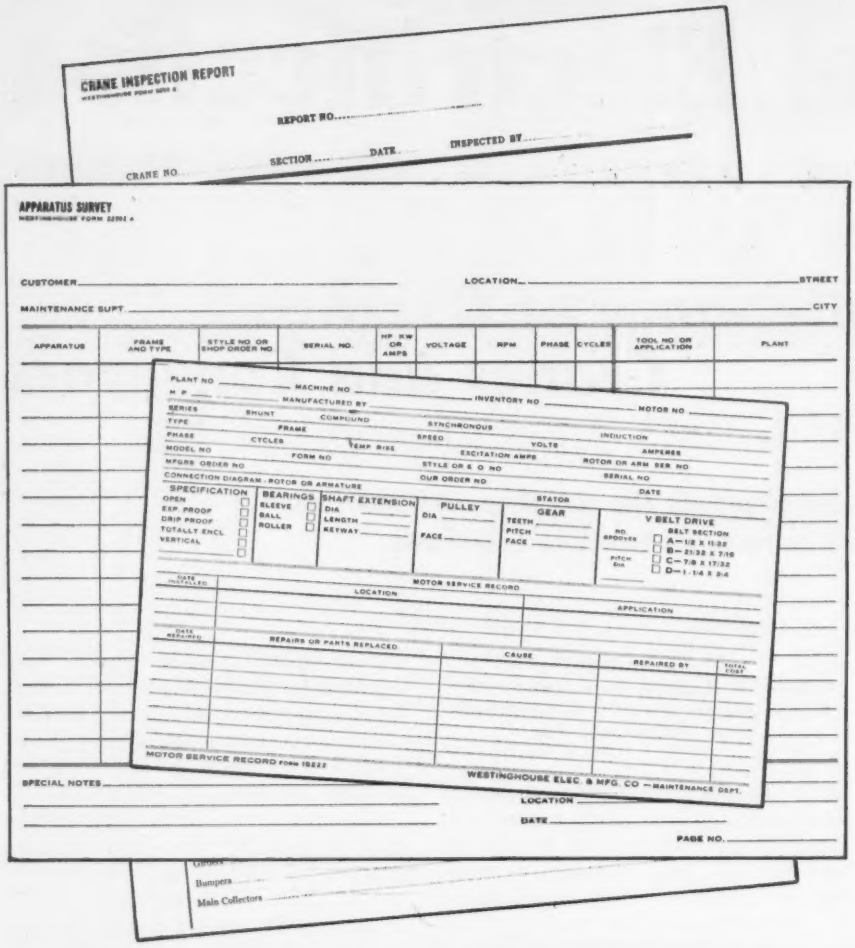
Any system of Preventive Maintenance can be greatly assisted by employing proper application principles at the time the drive is installed. Equipment which is improperly applied can naturally be expected to require an unnecessarily high amount of maintenance attention. Such maintenance is required in an effort to obtain from the equipment performance for which it was not designed.

Attention should be given at the time of application to installing equipment with adequate rated capacity for the job to be done. Thinking electrically, I refer to both the torque capacity of the motor and the thermal capacity which must be adequate to handle the needs. For example, equipment such as cranes in bucket service will be called upon to operate on a regularly repeated duty cycle. Therefore, in addition to torque capacity, adequate thermal capacity must be secured in the motor or else excessive winding maintenance will result.

A properly rated motor must also be properly protected from disturbing environmental influences. I refer to the use of open, splash-proof, or totally enclosed motors as the application may warrant. A foundry type crane operates where a great amount of fine dust is in the atmosphere and totally enclosed equipment is desirable. Another example is the use of a squirrel cage gearmotor drive with splash-proof construction. This degree of protection is a very useful compromise where thermal capacity and adequate protection are both a requirement. Totally enclosed motors suffer a severe



***BUCKET CRANES** operating on regularly repeated duty cycle require adequate thermal as well as torque capacity in minor design to eliminate excessive winding maintenance.*



***FORMS** used at Westinghouse plant cover crane inspection report, motor service records and apparatus survey.*

MOTORS	CONTROL	WIRING
CLEAN WINDINGS, DUCT AND BRUSH RIGGING	KEEP EQUIPMENT CLEAN	KEEP IN SAFE CONDITION
LUBRICATE REGULARLY AND CAREFULLY	KEEP CONTACTS SMOOTH	CHECK EXTENSIONS & DROP CORDS
CHECK BEARINGS TEMPERATURE OIL RING END PLAY	REPLACE WORN PARTS	KEEP JUNCTION BOXES CLEAN
CHECK AIR GAP	KEEP CONNECTIONS TIGHT	
INSPECT BRUSHES GOOD SEAT CORRECT GRADE	CHECK OVERLOAD DEVICES	FUSES
INSPECT EXPOSED LEADS	TRANSFORMERS	CHECK SIZE
INSPECT GROUND CONNECTIONS	KEEP OIL IN GOOD CONDITION	KEEP FUSE CLIPS CLEAN & TIGHT
	MAINTAIN OIL AT PROPER LEVEL	KEEP FUSE AND SWITCH CABINETS TIGHT
	PREVENT EXCESSIVE TEMPERATURE	

***MAINTENANCE CHECK CHART** serves as a good reminder of salient points to cover in a maintenance program.*

curtailment of root mean square horsepower capacity.

Control equipment must be considered right along with motors in the matter of enclosure. Open panel installations are useful when in a machinery house or in an atmosphere which is not too polluted with dirt or fumes.

Aside from the matter of selecting electrical apparatus with the proper rating, enclosure, etc., a basic problem of selecting the proper type of drive—the correct motor and control system—warrants consideration. For instance, both squirrel cage and wound rotor motors are used for conveyor drives. On conveyors which are of considerable length and require long starting periods, squirrel cage motors are apt to become overheated. This starting duty, while not causing a failure on one start, if continued repeatedly over the years can be a source of high maintenance for rotor parts. On such applications a wound rotor motor is proper.

Similarly, the use of manual versus full magnetic control is a decision which should be carefully weighed. Where equipment is to be used in continuously repeated or hard duty, and certainly if it is to be used on a duty cycle operation such as an unloading crane or frequently started and reversed conveyor, full magnetic control is warranted over manual control. Manual drum controllers on such extremely severe service will require an excessively large amount of maintenance attention. But, for only intermittent service or once-a-day starting, the manual type of control equipment is justified both from the standpoint of economics and reasonable maintenance.

Resistor units also warrant consideration. In cases of excessive vibration or where light weight is required, we suggest the use of edge-wound resistors. The use of edge-wound resistors with tie rod supported terminals is dictated to permit the leads to be tied on to the stationary terminals so that vibration in them will not be reflected into the resistor ribbons. Cast resistors are somewhat more brittle and, where subject to excessive vibration, can be a source of excessively high maintenance.

Preventive Maintenance System

Having secured an installation of proper electrical equipment which can be properly and economically maintained, the next consideration is the establishment of a Preventive Maintenance program. To do this a careful analysis must be made of *your own*

WORK SCHEDULE FOR CLEANING AND INSPECTING ELECTRICAL POWER EQUIPMENT

DIV.	OPERATION	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
GEN.	Clean Cubicles	Sec. C	Sec. O & D	MC7, MP, MK3	Sec. A	Sec. B		Sec. C	Sec. O & D	MC-7, MP, MK-3	Sec. A	Sec. B	
	Clean Bds. Insulators & Wiring	Sec. C	Sec. O, E & D	MC7, MP, MK3	Sec. A	Sec. B East	Sec. B West	Sec. C	Sec. O, E & D	MC-7, MP, MK-3	Sec. A	Sec. B East	Sec. B West
	Clean & Grease H.V. Disc. Swo.	Sec. C	Sec. O, E & D	MC7, MP, MK3	Sec. A	Sec. B East	Sec. B West	Sec. C	Sec. O, E & D	MC-7, MP, MK-3	Sec. A	Sec. B East	Sec. B West
	Clean H.V. Trans., Reg. & Read Temp.	151 to 159, 165 to 170		172 to 183	161 to 164			151 to 159, 165 to 171		172 to 183	161 to 164		
	Make Insul. Test of H.V. Trans. Oil	151 to 159		172 to 177	161, 162			165 to 170		178 to 183	163 to 164		
	Check Relays	874, 875, 800, 801, 800, 890	802 to 805	806 to 811	812 to 815	816 to 820	821 to 825	826 to 829	830 to 833	834 to 839	840 to 843	844 to 848	849 to 853
	Check H.V. Overload Devices		152	250, 251			74, 80, 81			252, 253, 354, 355			
	Check W. H. Meters		507, 517, 518					519, 520, 550			535, 536		
	Clean & Inspect Oil Bkrs.	100 to 111	150 to 153, 200 to 203, 397 to 404	250 to 256, 300, 302, 303, 350 to 356	1 to 33	50 to 68	69, 70 to 83, 85 to 87	100 to 111	150 to 153, 200 to 203, 397 to 404	250 to 259, 300 to 303, 350 to 356	1 to 33	50 to 68	69, 71 to 83, 85 to 87
	Temp. & Megger Rotating Machs.		174 to 181, 150 to 173						174 to 181, 150 to 173				
	Megger H.V. Cables					1 to 28						1 to 28	
MOTOR	Clean Cubicles												
	Clean Bds. Insulators & Wiring	Sec. F		MB17, MG2	W17, E1	Sec. S East	Sec. S West	Sec. F		MB-17, MG-2	W-17, E-1	Sec. S East	Sec. S West
	Clean & Grease H.V. Disc. Swo.	Sec. F		MB17, MG2	W17, E1	Sec. S East	Sec. S West	Sec. F		MB-17, MG-2	W-17, E-1	Sec. S East	Sec. S West
	Clean H.V. Trans., Reg. & Read Temp.		201 to 207, 229 to 243			208 to 228, 244 to 246			201 to 207, 229 to 243			208 to 228 244 to 246	
	Make Insul. Test of H.V. Trans. Oil		201 to 207			208 to 214			229 to 236			237 to 243	
	Check Relays	869 to 870, 877, 883 to 888						871 to 873		570 to 572			
	Check H.V. Overload Devices												
	Check W. H. Meters	540 to 544			512 to 515				526		527 to 529		
	Clean & Inspect Oil Bkrs.		500 to 524	580 to 591, 570 to 573	550 to 555, 590 to 598	456, 464 to 464	468 to 482		500 to 524	580 to 591, 570 to 573	550 to 553, 590 to 598	450 to 464	465 to 479
	Temp. & Megger Rotating Machs.					120 to 125						120 to 125	
	Megger H.V. Cables				29 to 58						29 to 58		
SWGR.	Check Cubicles	K-10	K-27					K-10	K-27				
	Clean Bds., Insulators & Wiring	K-10, K-30, K-70	K-27	MD, MX15	P1, R16, R17	R-27		K-10, K-30, K-70	K-27	MO, MX-15	P-1, R-16, R-17	R-27	
	Clean & Grease H. V. Disc. Swo.	K-10, K-30, K-70	K-27	MD, MX15	P1, R16, R17	R-27		K-10, K-30, K-70	K-27	MO, MX-15	P-1, R-16, R-17	R-27	
	Clean H.V. Trans., Reg. & Read Temp.			300 to 315, 333 to 343			316 to 332, 350 to 355			300 to 315, 333 to 343			316 to 332, 350 to 355
	Make Insul. Test of H.V. Trans. Oil			300 to 307			317 to 319, 324 to 332			308 to 315			333 to 346
	Check Relays			854 to 857						858 to 859			
	Check H.V. Overload Devices												
	Check W. H. Meters												
	Clean & Inspect Oil Bkrs.	600 to 602, 630 to 634, 640 to 641, 788	610 to 624, 788	760 to 765, 785, 790 to 788	645, 650 to 657, 750 to 752, 788	700 to 711, 788	712 to 725, 788	600 to 602, 630 to 634, 640 to 641, 788	610 to 624, 788	760 to 768, 780 to 788	645, 650 to 657, 750 to 752, 788	700 to 711, 788	712 to 723, 788
	Temp. & Megger Rotating Machs.		140 to 143			200 to 203			140 to 143			200 to 203	
	Megger of H.V. Cables			59 to 85						59 to 85			

DEFINITE INSPECTION schedule is important to efficient plant operation. Work schedule similar to this one can be developed for material handling equipment.

particular needs since no text book, electrical manufacturer, or firm of industrial engineering experts can present a program of preventive maintenance based on country wide experience which will exactly fit your immediate needs. Any suggestions made here are general in scope and must be tempered by *your particular problems encountered in your own plants and industries.* Chief elements of a Preventive Maintenance Program are:

Inspection
Reconditioning
Schedule
Records
Spare Parts
Personnel

INSPECTION

Maintenance programs of the past have been concerned mainly with fixing things up after they have broken down. The key of a *Preventive Maintenance Program* is the establishment of an Inspection Department consisting of men capable of making a thorough and regular inspection of the cranes and conveyor equipment from *both* a mechanical and electrical viewpoint. They should inspect the crane when in operation and when idle and should make only very minor electrical adjustments.

The inspector should make a complete report on the condition of the equipment. The report form used by our Headquarters Crane Inspection Department covers all crane equipment. On the front of the report is kept a record of the crane, its location, and the date and by whom it was inspected. Detailed inspection covers the general wiring, controllers for each of the respective motors, and resistors for each of the motors. For the bridge drive, an inspection is made of the motor, foot brake, shaft and bearings, gears, track wheels, trucks, guards, girders, bumpers and the main collectors. Main hoist inspection covers the motor, shaft and bearings, gears, sheaves, blocks, chain or cable, drum, guards, beam, limit switch, mechanical brake, dynamic brake, motor brake, intermediate brake. Slings, be they chain, cable or rope, are frequently inspected by another group.

Auxiliary hoist inspection is done in a similar manner. For the trolley drive, inspection is made of the motor, shaft and bearings, gears, trucks, wheels, guards, collectors, fan wires. At the conclusion of the report, ample space is left for any general comments which the inspector may have. Such an inspection is made at from *three to six week intervals* depending upon the frequency of use of the given piece of equipment. The report either is placed in file if the condition of the equipment is adequate, or forwarded to the reconditioning group if attention is needed.

Inspectors must be given adequate authority to shut down a piece of material handling equipment if safety or equipment damage considerations warrant it.

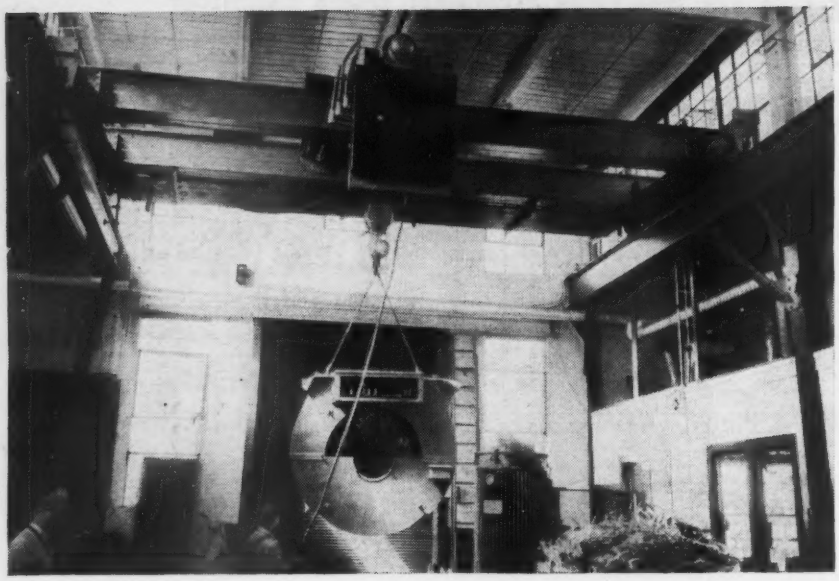
RECONDITIONING

Routine maintenance and reconditioning is best performed by crews of men, other than the inspectors, with both mechanical and electrical training. Frequently such items as electrically released, mechanical brakes lead to "jurisdictional" problems of responsibility. Such situations are avoided by combining people with both backgrounds into the squad.

These squads work on a routine schedule of maintenance attention to the apparatus and respond to the particular deficiencies of an emergency nature which may be reported by the inspector.

SCHEDULING

It is a relatively easy matter to set up a Preventive Maintenance Program and establish departmental responsibilities. It is another matter to keep the system functioning smoothly and



GENERAL PURPOSE CRANE with intermittently rated motor is typical of material handling equipment that warrants regular, scheduled maintenance inspection.

with a minimum interference with production. It is of the utmost importance that both the inspection and the reconditioning and service work be scheduled during the idle periods of the material handling equipment. If this is not possible, ample warning should be given to the Production Department to minimize any inconvenience.

RECORD SYSTEM

Another distinguishing feature of Preventive Maintenance is an adequate set of records. These records can cover either the specific piece of electrical equipment or the entire machine, such as a record for a crane or a conveyor. By such records I refer to some form of card or sheet filing system on each unit on which would be a record of the apparatus to which it refers, the date it was purchased, and some identification, preferably the manufacturer's identification of it. In addition, the dates when the apparatus was inspected and reconditioned or serviced is necessary, the condition in which it was found, the cause if apparent, the work done on it, and possibly the material required. Such a card, if kept for the various pieces of equipment in the past, will give a complete history even if the motor should be moved from one application to another. In such a case it is conceivable that some event during the time the motor was operating, say as a hoist motor, might account for deficiencies in performance after it had been shifted to operation on a trolley drive. Such examples as I have just mentioned might well occur around certain steel mills where standard armatures are stocked and readily replaced in motors in any portion of the mill.

Good records, if maintained, will provide in a sense the nerve system of the Preventive Maintenance program in that they will detect equipment requiring too frequent maintenance and serve as a guide for the replacement of that particular equipment item.

Pieces of equipment which accumulate a record of continuous service over long periods without need of maintenance will justify a modification of the inspection program to permit the staff to devote its attention to those equipments requiring most frequent inspection and servicing. Any weaknesses such as the tendency of personnel to overlook certain operations, or the inadequacy of certain replacement parts to meet a given need will readily show up on such records.

SPARE PARTS

A Preventive Maintenance System will be severely handicapped unless it is supported by an adequate supply of spare parts. There are two particular phases to this problem—the first deals with the quantity and variety of products to be stocked.

Electrical manufacturers can make suggestions regarding the quantity and selection of spare parts stock. Typical examples: A given number of stator coils are suggested for each single motor in use, or if you have 10 motors in use the amount stocked remains the same; one set of carbon brushes for d-c motors if one motor is used; two sets for five motors, and four sets for 10 motors. Recommendations of this type can be secured from the electrical manufacturer.

Here again, the particular problem of *your* plant must be considered and taken into account when considering a manufacturer's listing of suggested parts. You should consider the frequency of the need of the various parts in your plant and also the ease and availability of replacement. This was clearly brought out during the war when plants had to carry additional stocks of spare parts because of the long shipment on spare items which they might have to order. Here again, in the matter of selecting the parts to be stored, the records referred to earlier will be of the utmost value.

The second phase of the spare parts problem is to have parts adequately and accessibly stored and adequately protected from moisture, dirt, and heat. Replacement parts should be as near "factory fresh" as possible.

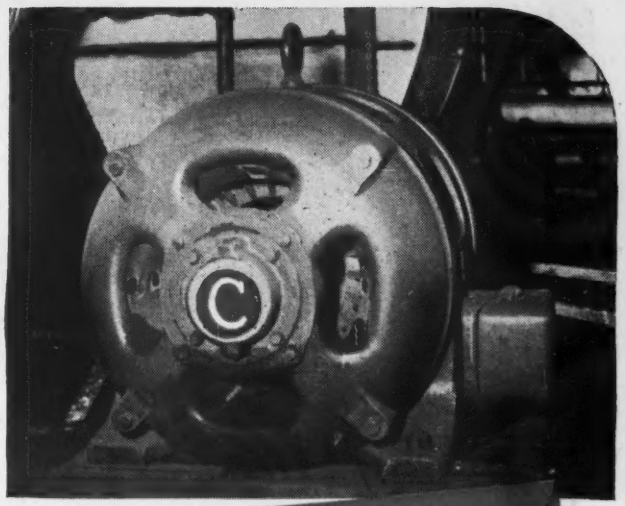
PERSONNEL

The life blood of a program such as we have outlined is an adequately trained and sufficiently interested crew of inspectors, reconditioning and service men, storekeepers and clerks. Training material for these people is best secured from experience. There are also numerous sources of material supplied by the electrical manufacturers which can serve as a basic primer and also as a quick refresher course from time to time.

Among the aids which electrical manufacturers can offer to the industrial user are:

1. A list of the renewal parts, identification, and a suggestion as to the spare parts which should be stocked.
2. Complete stock bulletins and price catalogs to permit ready identification and pricing of each piece of renewal parts apparatus required; also a record of the stock carried in each district warehouse.
3. For those plants contemplating development of a Preventive Maintenance System, a survey that will provide the owner with a listing of all of the electrical apparatus of specific manufacture identified not only with manufacturer's identification but also with that of the owner's system. Such a survey would also include a complete tabulation of the renewal parts carefully identified and a suggestion of an adequate spare parts stock to be carried.
4. Established manufacturing and repair plants which are available at your call for major repair and special maintenance work requiring special techniques.
5. Various manufacturers' and other publications carry articles which introduce and review maintenance tools and their use and contain handy hints from the practical experience of maintenance people.

Century 40 horsepower, type SC motor driving an induced draft fan for a stack.



From Century's Line of Electric Motors You Can Select

1 Right Kind—*to match your current supply*
2 Right Type—*to meet your load characteristics*
3 Right Protection—*against atmospheric hazards*
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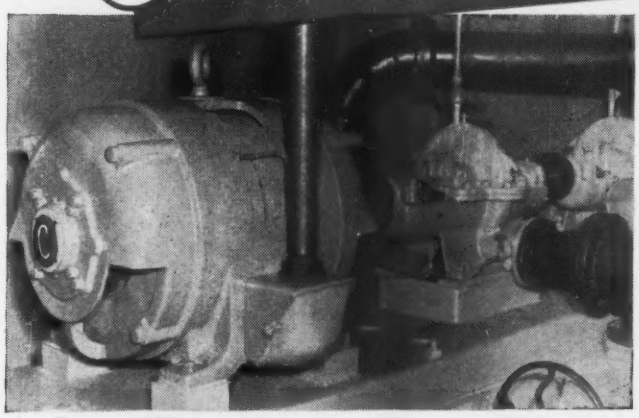
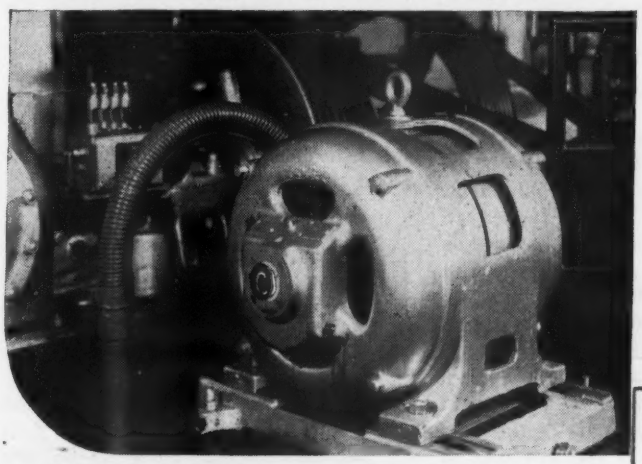


Century 150 horsepower, type SC motor driving a two-stage centrifugal pump in a city water plant.



Two Century 75 horsepower SC high torque motors driving refrigeration compressors.

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Reader's Quiz

Induction Motors

QUESTION 318 — In giving 3 phase induction motors a no-load running test using a clamp ammeter, it sometimes happens the readings show quite a difference, yet when the motor is connected to its load and another test is made with the same ammeter, the 3 phase readings are more nearly balanced or exactly so. This does not always happen, but I have noticed it more on 3 phase slip-ring induction motors. Why is this?—W.A.B.

A. TO QUESTION 318—An exact current balance in three phase induction motors is quite unusual. The cause may lay with the motor, or with the power supplied to the motor.

Assuming that the internal motor connections are correct, and that all joints are of negligible resistance, a slight current unbalance will result from the variations from perfect mechanical symmetry that are unavoidable in commercial motor production. This unbalance is usually a negligible amount.

The more common cause of a noticeable current unbalance lies in an unsymmetrical supply source, or unequal line impedance. The latter may result from poor joints or many connections in the supply lines.

A simple method to determine whether the unbalance arises in the motor, or in the supply, is to take current readings in the three phases. Then change the line connections and take comparative current readings. It will be found that there are three possible connections for each direction of rotation. If the current readings with the various connections agree closely in each phase, the cause of unbalance is in the motor. If these readings do not agree, phase for phase with the original test, it indicates that the unbalance arises in the supply circuit.

It is sometimes informative to check the phase voltages for symmetry, both with and without the motor running. —R.J.

A. TO QUESTION 318—When the induction motor is running at no load, the currents should still be balanced in a three phase machine. However, the following may have occurred to the machine. The motor may have been rewound at some time and the phases may not have been made exactly equal. Inasmuch as the no load current is practically entirely magnetizing current, small variations in coil turns will cause relatively large changes in magnetizing current. On the other hand, when the power current is drawn, i.e., when the load is applied to the motor, these small differences in magnetizing current will disappear and be swamped by the power current. The fault does not lie in the tong tester; any other type of meter will show the same differences.

Another angle that may be considered is that the wave shape of the magnetizing current may be different for all three phases. Depending upon the type of meter, these changes will give different readings. The load current will be symmetrical for all phases and therefore the meter will read the same for all phases.—H.H.S.

A. TO QUESTION 318 — In making a no-load running test on polyphase motors, you must keep in mind that the current being measured is actually nothing more than the magnetizing current of the motor except for a very small component representing friction loss. Inasmuch as this magnetizing current of the motor is very small, its in phase component is of course practically negligible. Therefore, we can assume that the total current being measured at no-load is almost entirely reactive component. Therefore, if you should happen to connect the motor in such a manner as to have one phase reversed, you can readily see that the vector analysis would lead to an unbalance of the currents in the 3 phases.

However, as soon as load is applied to the motor, the reactive component becomes only a small part of the total current compared to the in-phase or copper-loss component. Therefore, the greater the tendency will be to balance the motors on the 3 phases. This is readily apparent in the fact that the power factor of the motor increases quite markedly from no-load to full-load.

This condition would be more apparent in a delta-connected motor than in the Y-connected type and as you know, both types are commercially available.

From my experience, I would suggest that in order to eliminate this condition of unbalance at no-load, you might try using three 200 volt, 1 or 2 mfd. condensers connected across the motor terminal and Y-connected to the ground. This will tend to eliminate the reactive component of your no-load current and will, therefore, give you more nearly perfect balance for your no-load running test.—R.D.R.

A. TO QUESTION 318 — The unbalanced condition given by W.A.B. can be due to a number of faults, some of which are, poor brush contact, flat slip ring (causing added resistance) grounds on rotor winding, momentarily opened or shorted rotor coils and numerous others such as poor design, rotor out of round, stator out of round, etc. It must be remembered that the induction motor on no load has a very low power factor, generally 0.50 or less and that the no-load current is simply a magnetizing current. The motor running at practically 0 slip (synchronous speed) develops little or no counter E.M.F. can be likened to a transformer operating at the same P. F. A more accurate no-load current test is made with two wattmeters As the P. F. is 0.50% or less, the difference of the two readings will equal the third leg.—J.V.H.

Float Switch

QUESTION 319—We have two 15 hp. sump-pump motors which now cut in and out simultaneously. Each motor is started and stopped by its own float switch and automatic starter. We know that one motor can do this job most of the time, but there

1 **1897**—America's first cars, hand-built and expensive, looked like this. Big questions of the day were—will it run? can I ever afford to buy one? Little thought was given to washing a car.

2 **1915**—Howell "Red Band" Motors arrived. The electrical horsepower age was already under way. Automobiles, as well as other goods and services, were soon to be better, cheaper.

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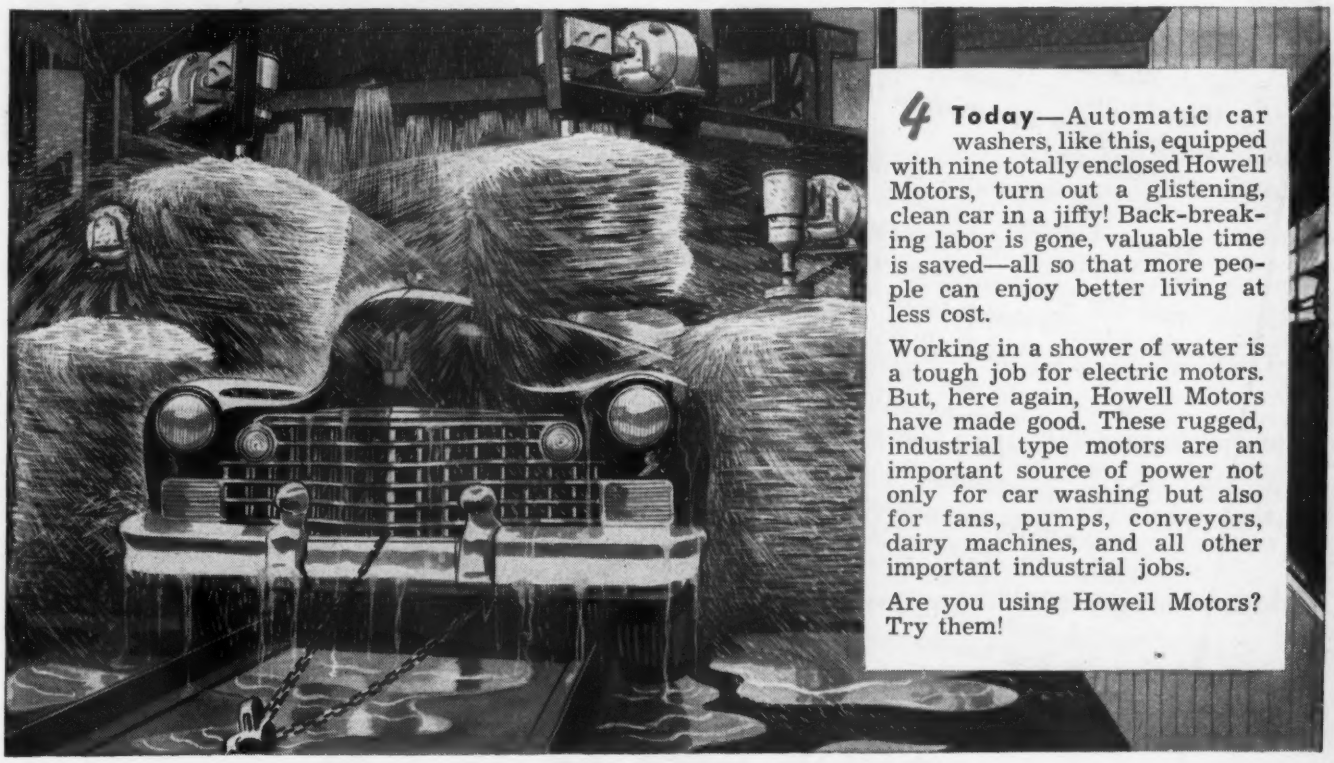

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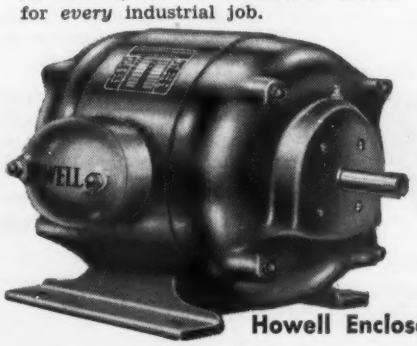

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Ronald G. Thring, *Electrical Engineer*
Capital Transit Co., Washington, D. C.

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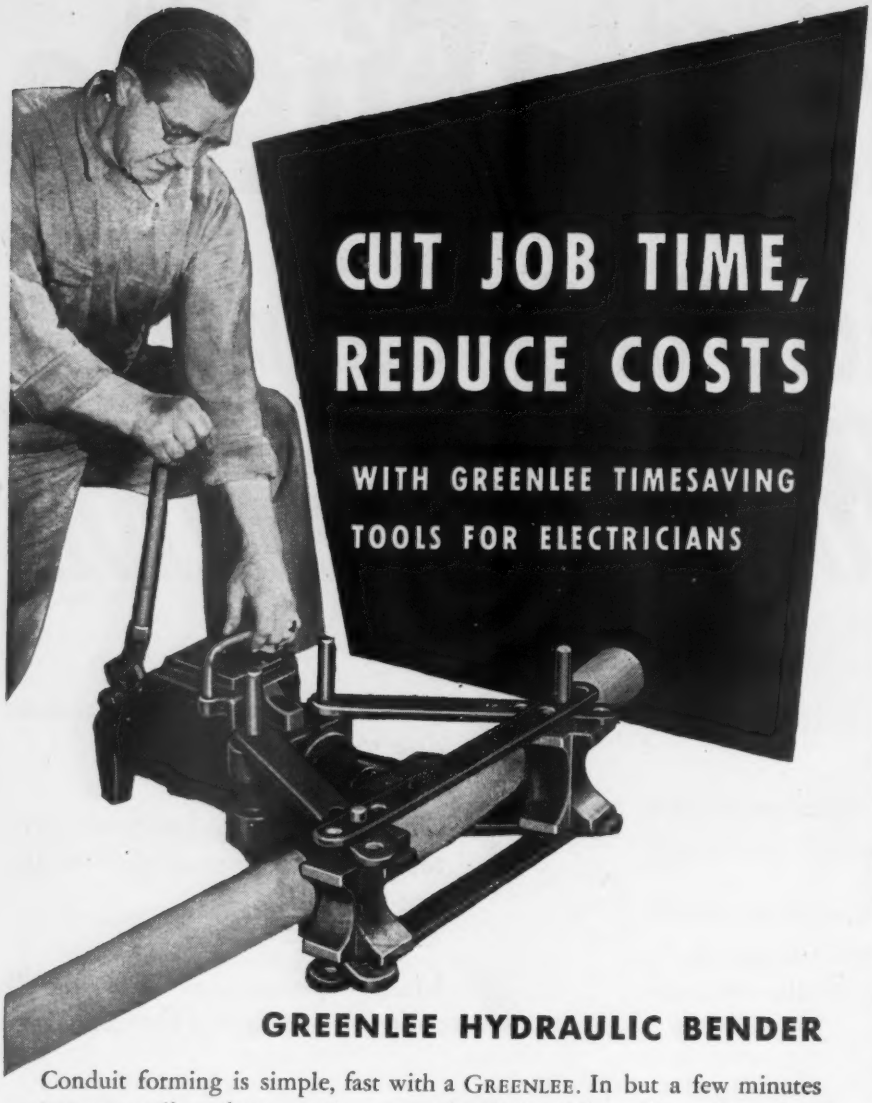

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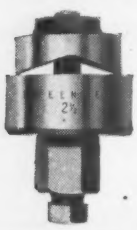

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are periods when the flow is too much for one pump.

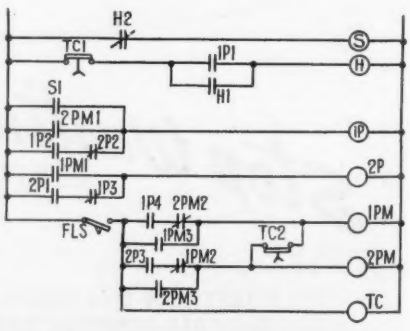
What we want to know is what would be necessary to have the pumps alternate each start and also to cut in the idle motor when the flow is too much for one pump. We would prefer to have pumps alternate each start. Floats are in an open pit. Please give diagram.—P.J.F.

A. TO QUESTION 319—The diagram herewith (control circuits only), causes the two pumps to alternate at each closing of the float switch. Were the load excessive for one pump, the idle pump will intervene. Operation is as follows:

Energization of the circuit will pull in relay "S". Contact "S1" will energize relay "1P" which will hold itself through contact "1P2". Contact "1P1" will energize "H", which, through "H2" will drop out "S". "H" will hold in as long as power stays on, through "H1" and normally closed timer contact "TC1". This will render relay "S" equivalent to a momentary pushbutton, which will operate automatically whenever current is turned on.

"1P4" being closed, motor starter "1PM" will pull in and run pump No. 1 when the float switch "FLS" closes. Contact "1PM1" will now energize "2P", opening "2P2" which will drop out "1P", closing "2P1" which will hold in "2P" after "1PM1" opens when the float switch opens.

"1PM2" will hold "1PM" in although "1P4" has opened and "2P3" closed, and "1PM3" will prevent "2PM" from starting up. Thus "1P" and "2P" will alternate with each start respectively of pumps "2PM" and "1PM", and pumps "1PM" and "2PM" will alternate with each closing of the float switch.



Timer "TC" can be so adjusted that if a pump runs longer than a scheduled period without succeeding in opening the float switch, through closing of contact "TC1" the idle pump will step in. At the end of a cycle of simultaneous running of both pumps, neither "1P" nor "2P" would be in, since "1P" "1PM" and "2PM" would have

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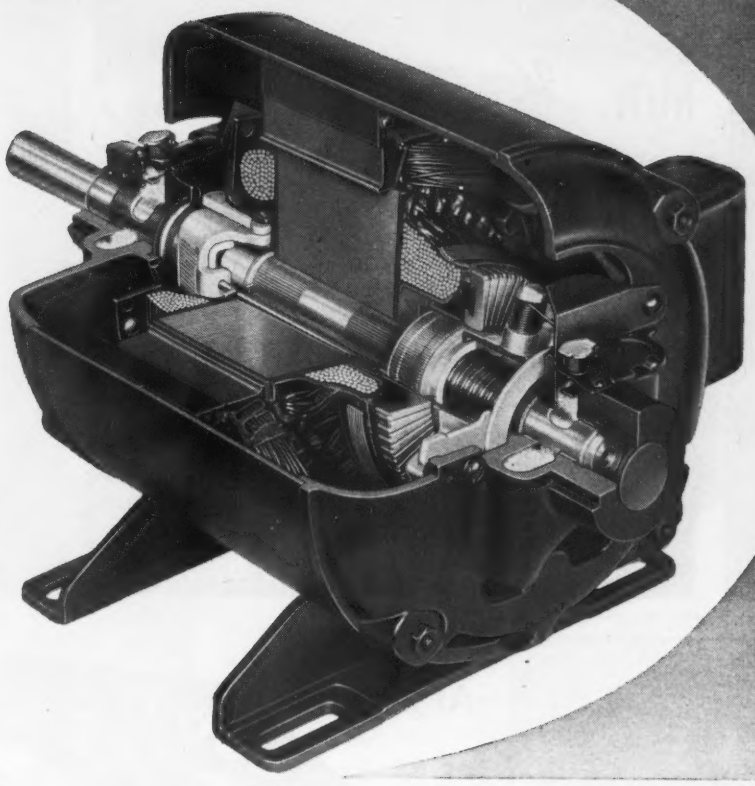

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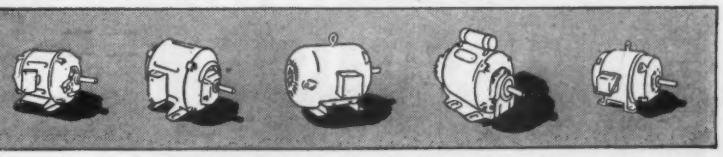

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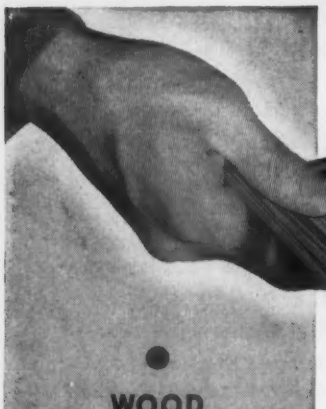

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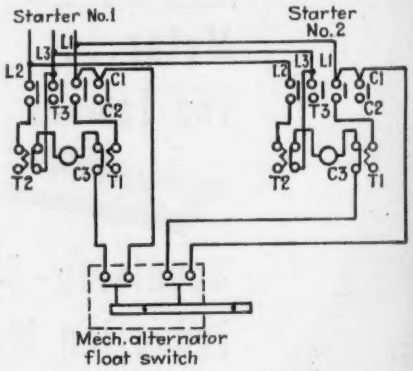
dropped out simultaneously, neutralizing holding contacts "1P2" and "2P1". However, timer contact "TC1" opening as the timer timed out, would have reset relay "H" as if power had failed, and the next time the float switch closed, pump No. 1 would run alone again.

The system requires 4 pilot relays, 2 n.o. & 1 n.c. interlocks on each motor starter, and a split contact timer, with only one float switch.—E.K.

A. TO QUESTION 319—By installing a Square D Mechanical Alternator Class 9049, Type A, 5R-1551M1G1, the action is such that two switch units are alternated on successive cycles. If the liquid level continues to rise with one pump in operation, the lever will continue to travel to



a further position at which point the second switch will be operated, throwing the second pump across the line.

When the tank has been emptied, the switch unit will again alternate on successive cycles. Diagram is above. —E.C.L.

A. TO QUESTION 319—The first requirement, i.e., to cut in the idle motor when the flow is too much for one pump, is easily attained with two float switches. One float switch starts the first pump when the water in the sump rises to some predetermined level, and stops the pump when the water drops to a lower level. If the first pump cannot handle the flow into the sump, the water level will continue to rise to a higher point so that the second float switch closes, starting the second pump. Both pumps are then running and, assuming they have sufficient combined capacity, the water level will be lowered to the point where both switches open and both pumps will be stopped.

The above arrangement of course puts a greater duty on the first pump. The accompanying diagram provides a circuit for alternating the flow of two pumps, still cutting in the idle motor when the flow is too much for one pump.

Referring to the diagram, assume

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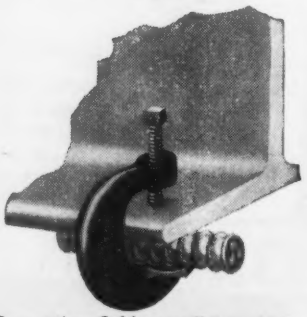
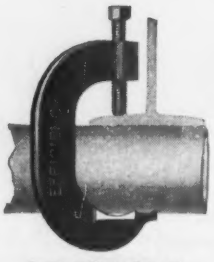


Supporting Cable parallel to beam



Supporting pipe at right angle to beam

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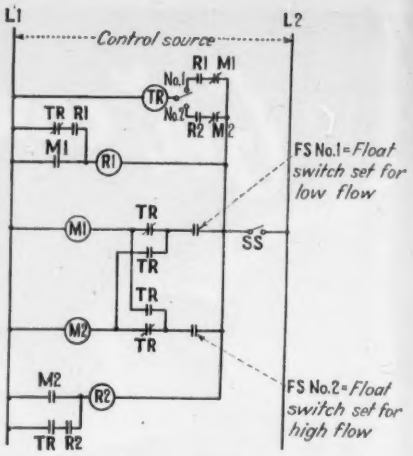


M1 = *Coil of No. 1 pump magnetic starter, having one N.O. and one N.C. auxiliary contacts*

M2 = *Coil of No. 2 pump magnetic starter, having also one N.O. and one N.C. auxiliary contacts*

R1, R2, = *Auxiliary relays, each with two N.O. contacts*

TR = *Transfer relay, electrically operated and mechanically held, T.P.D.T., with auxiliary throw-over switch in its coil circuit. (Manufactured by Automatic Switch Co.)*

S.S. = *Starting switch, maintained contact*

transfer relay TR has its contacts in the position shown, with its auxiliary throwover switch in the No. 1 position. Starting switch SS is closed. When the first float switch FS1 closes, M1 is energized, starting pump No. 1. The N. O. contact of M1 also closes, energizing relay R1, which picks up and seals itself in through a closed contact of TR. The other N. O. contact of R1 closes and sets up a circuit to energize TR through the N. C. contact of M1. The latter, however, had previously opened when M1 was energized, so TR is not yet energized.

Pump No. 1 runs until the level in the sump drops sufficiently to open FS1. If, however, the water level keeps rising, FS2 closes, energizing M2 and starting pump No. 2. Relay R2 also picks up, but TR is not affected because its auxiliary throwover switch is still in the No. 1 position.

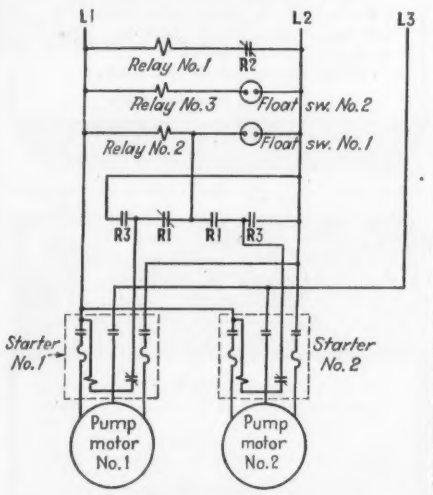
When the water level finally drops to minimum level, both float switches open. When M1 drops out, its N.C. contact closes and energizes TR, which throws over and opens its previously closed contacts and closes its previously open contacts. The seal-in circuit of relay R1 is thus opened, dropping out R1. The auxiliary throwover switch transfers to the No. 2 position ,but previously R2 had been dropped out by M2 dropping out, so that TR is not immediately re-energized. The contact race inherent in this scheme can be eliminated by setting FS2 to open at a slightly higher level than FS1 opens.

When TR operated, its mechanically held contacts put M2 under control of FS1, and M1 under control of FS2, so that on the next rise of water level in the sump the first pump to start will

be pump No. 2, followed by pump No. 1 if required. After a cycle of operation by pump No. 2, TR will be again energized, transferring FS1 back to control of pump No. 1 and FS2 back to pump No. 2, and so on.—W.T.M.

A. TO QUESTION 319—Below is an elementary diagram showing a method of controlling two sump pumps by means of float switches and relays so that three conditions of operations may be had. The first condition is that only one pump will operate at a time as long as the flow into the sump is not too great for the pump's output; the second is that the pumps alternate on the pumping; and, the third is that the other pump will cut in if it is needed.

Three relays are used. Number one is a two pole ratcheting type relay with one pole normally open and the other normally closed. Relay number two is a single pole normally closed relay and relay number three is a double pole normally open relay. Float



switch number one is set to close at a slightly lower water level than number two. When float switch number one closes, pump number one is energized and relay number two is energized. Contacts on relay number two open de-energizing relay number one. As relay number one is a ratchet-type relay no contacts are opened or closed when it is de-energized. If the water gets high enough to close float switch number two, it will energize relay number three, closing its two contacts. These contacts energize the starters on both pumps so that when either is running the other is put in operation by float switch number two. Opening of float switch number two stops the pump it started as well as de-energizing relay number two. Contact number two then closes energizing relay number one which now reverses the positions of its contacts. On the next closing of float switch one, pump two will start.—O.H.

KLEIN

Adjustable Climbers

1939-ADJ Klein Streamlined Climbers

1901-M-ADJ Klein Standard Climbers

1903-ADJ Klein Lightweight Climbers

1945-ADJ Klein "Polemaster" Climbers Matched right and left

Adjustable climbers do away with the necessity of stocking many sizes. They assure proper fit both in summer when light shoes are worn and in winter when heavy overshoes are needed.

Klein Adjustable Climbers are made of forged steel, individually tempered and tested—the same high quality that has always been associated with the name Klein. Adjustable sleeve is seamless, one-piece construction, permitting climber to be adjusted to 15, 15½, 16, 16½, 17, 17½, and 18 in. sizes. It is secured to the shank of the climber by a steel bracket engaging through two holes and is secured with cotter pins. Write for Bulletin giving full information.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

This Bulletin giving complete information on Klein Adjustable Climbers will be sent on request.

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Silicone News

DC SILICONES

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For example, you can give your customers permanent lubrication by using DC 44 Silicone Grease. DC 200 Silicone Fluids enable you to design more compact hydraulic systems or make wider use of viscous damping. You can increase the power per pound ratio in electric machines by 50 to 100 per cent and you can increase the life of electrical equipment by a factor of 10 through use of Dow Corning Silicone—Class "H"—Electrical Insulation.

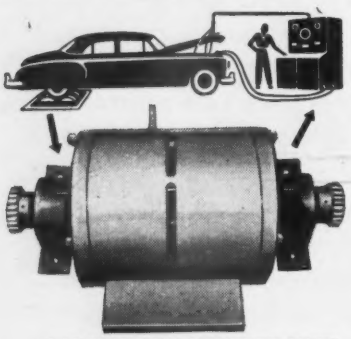

PHOTO COURTESY THE ELECTRIC PRODUCTS COMPANY

DC Silicone Electrical Insulation and DC 44 Silicone Grease improve the performance, cut maintenance and increase the life of E. P. Electric Chassis Dynamometers.

Typical application for Dow Corning Silicone Electrical Insulation is the Electric Chassis Dynamometer made by The Electric Products Company of Cleveland. Complete performance testing of automobile engines without actual road tests makes it necessary for the armature coils to absorb so much energy that operating temperatures are in the range of 400° F. Under such severe conditions, only Silicone Insulation and DC 44 Grease give long and trouble-free service.

Among many other applications, Silicone Insulation is used in building compact, high powered solenoids; portable welding transformers; bus generators and industrial motors. For more information about Dow Corning Silicone Electrical Insulation, write for pamphlet G11K6.

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FIRST IN SILICONES

Capacity of Condenser

QUESTION 320—How do you determine the capacity of a condensor for a capacitor-run motor? Is there a formula such as is used for capacitor-start motors and if so, what is it? The first mentioned formula has been used by our motor shop many times with success. That is why in the absence of manufacturers specifications we are looking for the requested information for a method of figuring capacitor-run motor condensors.—L.R.D.

A. TO QUESTION 320—On a capacitor run motor, we find the no load current of the motor winding. Then we test a capacitor to be sure that the capacitor draws a little less current than the motor winding under no load conditions. We must do this to guard against voltage resonance caused by placing an inductance and a capacitance in series, which would result in a high voltage and therefore a motor burnout, which is sometimes due to improper marking.—H.S.

Can You ANSWER these QUESTIONS

QUESTION X14—We sent a motor to the factory for complete rebuilding. The motor originally was a 440 volt, 3 phase, 720 rpm., slip ring motor. It is being rebuilt for 2200 volts, 3 phase, 1200 rpm. slip ring motor. What is the maximum horsepower increase that can be expected due to this change?—M.D.

QUESTION Y14—Our current problem is the measuring of the true resistance to earth of our ground rods without the purchase of a groundometer. We have a number of ammeters and voltmeters, both a-c and d-c, in many ranges. I know it is possible to use these to find true ground resistance, but how, and what is the formula?—L.R.D.

QUESTION Z14—Recently I tried to reverse a split-phase resistance start induction motor. The motor operates okay for the original rotation but will not come up to speed (no load) when reversed. The bearings and centrifugal switch appear to be in good condition. Why won't the motor come up to speed?—T.B.B.

QUESTION A15—Why did manufacturers stop using selenium rectifiers for low current d-c voltage circuits?—H.S.

PLEASE SEND IN YOUR ANSWERS BY JULY 15

Drill Masonry Fast, Easy

Kennadrills take the back-work, high cost, out of installation jobs wherever masonry is drilled.

They have a hard diamond-like Kennametal cutting edge that stays sharp up to 100 times longer, drills up to 5 times as fast.

Get Results Like This:

"50 holes—1½ inches deep in tile, per grind. Speed—40 seconds per hole."

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Kennametal drilled holes are true, smooth, sharp-edged. Blade action ejects the cuttings, prevents binding, sticking. Bits are ¼" to 1½" in diameter, and can be used in hand braces, drill presses, rotary drills.

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Insulation Breakdown: 9 models; meet A.S.T.M., A.I.E.E. Specifications.

"Donut" Current Transformers: 45 models, 25 to 133 cycle frequencies.

Limits Bridge: Production Line Resistor Testing.

Ground Resistance Testing: 2 models, 9 ranges—no cranking.

Geophysical Prospecting: For accurate horizontal and vertical strata mapping and surveying.

Hand Tachometers: 6 models, 9 ranges, direct reading.

Keeler Polygraph: (Lie Detector.)

Phase Sequence Indicator: 2 models, 115, 230, 460 volts.

Soil Resistivity Meter: 0-30,000 ohms per cubic centimeter.

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Model No. 3020—4-Lamp SLIMLINE with Louver

Lunches or Lingerie..

MITCHELL

"SLIMLINE" *Lights them All!*

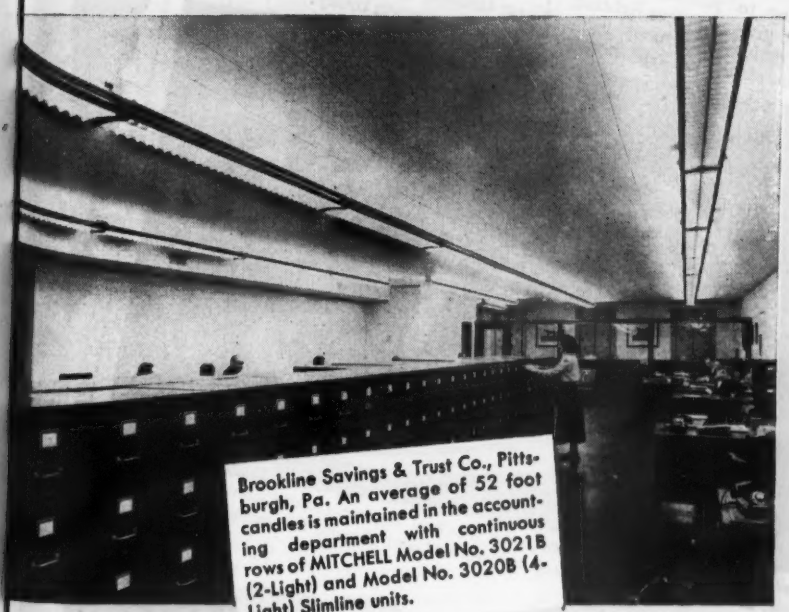
Jim's Grill, Huntington, West Virginia. MITCHELL Model No. 3020B Slimline fixtures provide a bright, inviting atmosphere in this well-designed coffee shop. Customers and employees applaud the lighting.

Right across the country, businesses of *every kind* are turning to MITCHELL "Slimline" to get the "selling" light they need. It's uncanny how one installation sells another—in whole communities the commercial lighting swing is to MITCHELL "Slimline".

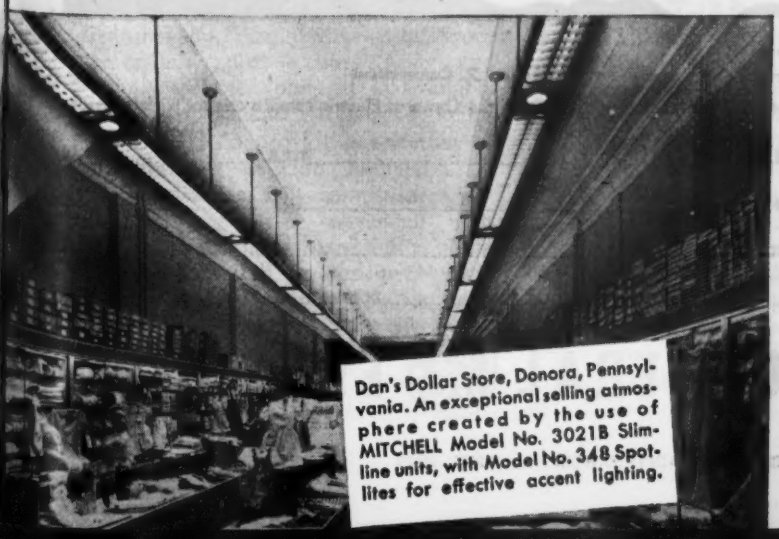
Progressive businessmen prefer this handsome, smooth, powerful lighting that creates a traffic-building sales-inviting atmosphere. They like the way MITCHELL "Slimline" puts appeal into merchandise, makes it more desirable and easier to sell—the way it produces *measurable* increases in sales and profits.

This user acceptance builds volume business for the wholesaler. MITCHELL "Slimline" installations are easy, smooth jobs for the contractor—time-saving profitable business. And utility men can recommend this superior lighting with confidence.

Whether it's automobiles or lilacs—MITCHELL "Slimline" lights *and sells* them all!



Brookline Savings & Trust Co., Pittsburgh, Pa. An average of 52 foot candles is maintained in the accounting department with continuous rows of MITCHELL Model No. 3021B (2-Light) and Model No. 3020B (4-Light) Slimline units.



Dan's Dollar Store, Donora, Pennsylvania. An exceptional selling atmosphere created by the use of MITCHELL Model No. 3021B Slimline units, with Model No. 348 Spotlites for effective accent lighting.

Write for complete descriptive literature covering MITCHELL Slimline fixtures. Ask for Bulletin No. 322 describing 4-Lamp units; Bulletin No. 339 describing 2-Lamp units; Bulletin No. 334 describing spotlight units. for use with Slimline fixtures.

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Remote Control System Offers Increased Share Of Construction Dollar

General Electric Remote Control Wiring System Promotes Expanded Use of Contractor's Services In Buildings of All Types

With the announcement of General Electric remote control wiring, structures of all kinds become expanded markets for wiring work. Because this new system now makes multi-switch wiring practical and economical for widespread use, it provides electrical contractors everywhere with a workable tool for "selling in" complete switch control on every wiring job.

Designed to fit in with existing installation techniques, the General Electric remote control system makes no change in materials and methods required for installing power circuits. The simple switching circuit is the only part of the system that presents a new installation idea. This circuit consists of a relay, a transformer, lightweight (number 18) wire, and the new, attractive remote control switch. Switches can be wired into the relay from many locations at various distances from the relay. "Easy as wiring a doorbell," was the way one observer described this part of the installation.

Adds Extra Value

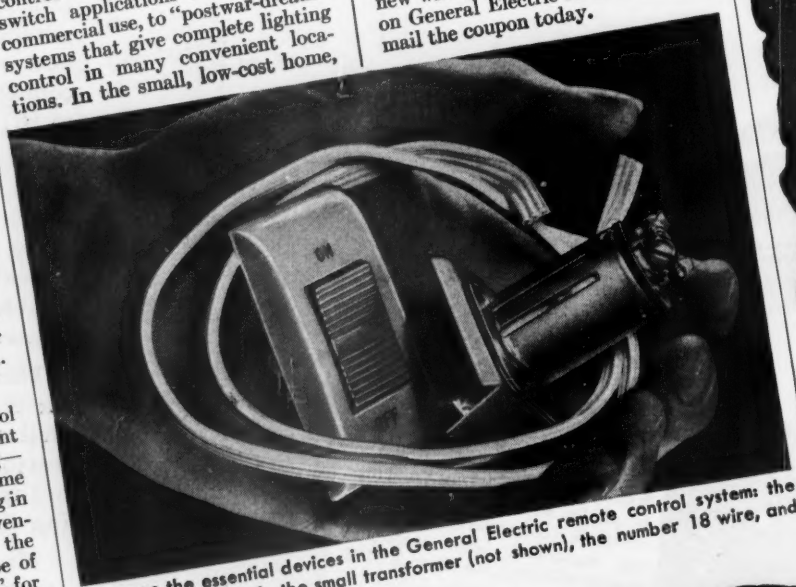
General Electric remote control represents an attractive investment to everyone interested in building—from the prospective small-home owner to the man who is investing in large-scale building. The convenience this system offers, and the extra value it gives to any type of construction, make it a "must" for any individual who is concerned about the workability and the future of his investment. Because of these positive values, the contractor will find a ready market among foresighted investors for the additional materials and services involved in remote control wiring.

Has Widespread Uses

The conveniences now made possible by General Electric remote control range from simple multi-switch applications for home and commercial use, to "postwar-dream" systems that give complete lighting control in many convenient locations. In the small, low-cost home, a simple system can be installed to give control of cellar lights from any floor in the house. In the more expensive unit, the system can be used to give control of attic fans, radios, yard lights, and bathroom heaters from various locations. Switches can even be installed at convenient chairside spots for complete "dream-home" lighting ease. For commercial and industrial buildings, there are unusual possibilities for local and centralized control of lights in various locations.

Increases Business

To the electrical contractor, General Electric remote control offers an exciting opportunity for broadening his services on every job he does. Everyone in the contracting field owes it to himself to investigate this new wiring system. For information on General Electric remote control, mail the coupon today.



Here are the essential devices in the General Electric remote control system: the new, attractive switch, the small transformer (not shown), the number 18 wire, and the relay.

Get ready
Mail Coupon today!

Section D29-618
General Electric Company, Bridgeport 2, Connecticut
Please send me your new booklet on the General Electric remote control wiring system.

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CITY.....ZONE.....STATE.....

GENERAL ELECTRIC

Equipment News

Panelboard

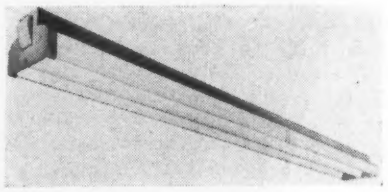
A new NTPS panelboard designed to provide group and branch circuit control of lighting distribution for stores, garages and residences has been announced. It has a hot-molded phenolic section containing six complete circuits. This section has been approved by the Underwriters' Laboratories. It was designed to fit standard stud walls without projections. Spacious wiring gutters and various sized knockouts have been provided to permit all kinds of wiring arrangements. They are made with 6 and 12 circuits and have solderless lugs in mains. Other features include quick-make, quick-break tumbler switches with large operating handles which are spring loaded but can be operated without spring assistance. Trumbull Electric Manufacturing Co., Plainville, Conn.

Instrument

An indicating controller, named "Multi-Switch" Capacitrol, has been developed for the measurement and control of process variables such as temperature, voltage, amperage, pressure, speed, etc. Incorporating such features as a "distant view scale," front accessibility, plug-in chassis design and voltage selector plug, it is available with a maximum of four switches (S.P.D.T.) to provide a selection of six different switching sequences. A high resistance, fully compensated, direct reading meter movement with Alnico V magnet is used for applications which fall in the pyrometric range. Models using resistance thermometer measuring systems are available for low temperature operation. Wheelco Instruments Company, 847 W. Harrison St., Chicago 7, Ill.

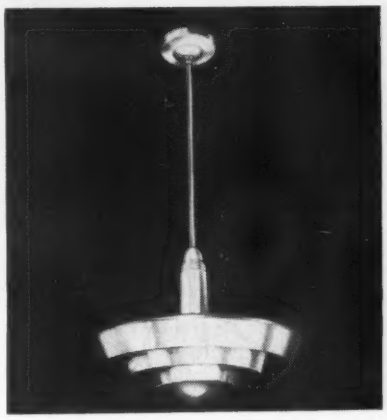
Wiring Devices

A new line of surface wiring devices for non-metallic cable which combine bases of porcelain with covers of brown bakelite, is now available. These devices are for surface wiring in temporary industrial buildings and housing, and in such rural or residential installations as garages, farm buildings, stables, attics and cellars. Installation requires mounting device, running wire and connecting to terminals. They meet REA and Federal Specifications and are listed by UL. Line consists of single and three way switches, keyless and pull lampholders, duplex convenience outlet, a rosette and a junction box. Bryant Electric Company, Box D, Barnum Station, Bridgeport 2, Conn.



Luminaires

Three new units have been added to this line of luminaires. The "Store-Liter," No. 7502-CLH, is a steel and plastic unit, utilizing two T-12, 96 inch fluorescent slimline lamps. High transmission side panels of extruded polystyrene provide high illumination on vertical surfaces such as shelf walls, clothes racks, etc. Side panels have lengthwise prisms on surface to refract and diffuse light. "Wall Strip," No. 53A, is a decorative wall unit using one 40 watt, T-12 fluorescent lamp. It can be installed on walls at various mounting heights, providing a wash of white or colored light on wall surfaces above and below luminaire. May be used in stores, private offices and conference rooms. A new recessed unit, "Punchy" No. 2240, is designed for use with one PAR-38, 150 watt projector flood or spot lamp. An aluminum gimbal ring permits adjustment of lamp to any angle 0° to 35° from vertical and 0° to 360° from horizontal. Constructed of steel and aluminum, unit is 8½ inches deep. Curtis Lighting, Inc., 6135 W. 65th St., Chicago 38, Ill.



Silver Bowl Lamps

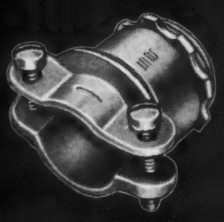
The new Seelux is an indirect luminaire for use with silver bowl lamps. Louvres are spun aluminum with a fine emery-grained finish and are protected with the Alzak aluminum process. The silver bowl lamp used in this unit contains the major reflector, and fixture can be restored to initial efficiency by a lamp change. Open louvers eliminate critical maintenance problems. Edwin F. Guth Company, 2615 Washington Ave., St. Louis 3, Mo.

Wall Switch Plate

A line of double-sized electrical wall switch plates that protect walls from soil has been announced. They contain 26 square inches and are perforated for easy installation on single tumbler light switches. Plates are finished in Alumilite processed basic shades, to blend in with any color scheme. Also available in scratch-proof patterns in stainless steel. Sianor Company, 3746 Kelley Ave., Cleveland 14, Ohio.

Scaffold

Anouncement has been made of a new utility model Hi-Lift extension scaffold. It starts as a 6 ft. ladder and extends to a 20 ft. scaffold. It is recommended for public buildings and industrial plants for cleaning and maintenance in high, out-of-reach places. It occupies a floor space as small as 29 by 54 inches. Scaffold is equipped with roller bearing swivel casters on all four legs. Atlas Industrial Corp., 849-39th Street, Brooklyn 32, N. Y.



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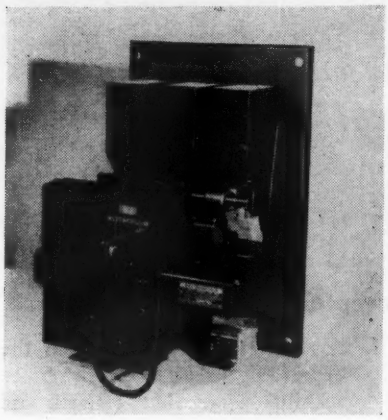


Circuit Breaker

A line of Type DB 600 volt d-c or 250 volt a-c circuit breakers with tripping characteristics for low-voltage power distribution in industrial plants, motor starting duty, and the like has been announced. Control for long time delay with protection from tampering is provided by a time-delay element assembled in an hermetically sealed tube. Conducting parts are assembled on a moulded insulating base which is mounted on a metal base for rigidity. Breakers are available for overcurrent protection with delayed and instantaneous tripping for use on motors and for general purposes, or for overcurrent protection with both long and short delay for proper coordination in selective protection on fault current. Two frame sizes are available. The DB-15 has an interrupting rating of 15,000 amperes with load current ratings up to 225 amperes at 600 volts a-c or 250 volts d-c. DB-25 is rated for load currents up to 600 amperes with an interrupting capacity of 25,000 amperes. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

Bearing Tool

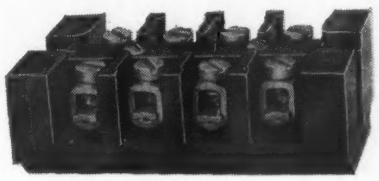
Worn sleeve bearings can now be removed from motor endplates and new bearings inserted in one operation with a new tool which has been developed. Tool consists of a steel rod, finished to accommodate precision bored bearings on one end, and unbored bearings on the other. A central shoulder separates the two ends. Bearing is slipped on the rod, its unchamfered end against shoulder of the tool. A spacer, furnished with tool, is slipped on with its unchamfered end against new bearing. End of tool is then inserted in old bearing, from inner side of endplate. A press or rawhide mallet is then used to drive tool until its shoulder seats against endplate. Spacer forces out old bearing, and new bearing, as it is pushed into its proper position, forces out spacer. Bearing tool is available in four sizes, for motors with finished bearing sizes of 0.655, 0.751, 0.812 and 1.062 inches. Wagner Electric Corp., 6489 Plymouth Ave., St. Louis 14, Mo.

Combination Plate

A new switch, outlet, and pilot light combination plate has been announced. Oval screw holes in plastic plates provide ample leeway in squaring. Two screws mount complete unit. Made in combination of four devices: 3-way switch, single-pole switch, outlet, and pilot light. In brown or ivory. Switches are "T" rated at 5A-250 volt, 10A-125 volt; outlet with double wipe contacts is rated at 10A-250 volt, 15A-125 volt; pilot light (6 watt lamp), at 75 watt-125 volt. Monowatt Incorporated, 95 Hathaway St., Providence, R. I.

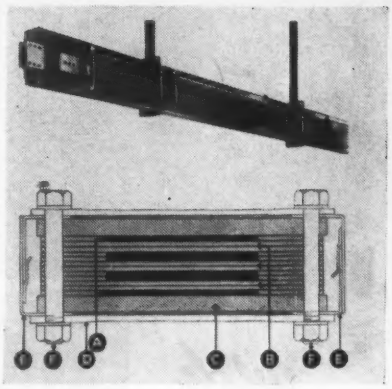
Tacker

Announcement has been made of the new L4-"TV"-tacker designed and constructed for tacking round coaxial cable securely to any wood or plaster using "L4D" ($\frac{1}{2}$ inch leg) staples. This tacker is also used for tacking 300 ohm twin lead-in wire using the "L4C" ($\frac{3}{8}$ in. leg) staple, which is driven parallel and between two outside wires. Markwell Mfg. Co., Inc., 200 Hudson St., New York 13, N. Y.



Terminal Blocks

The new solderless type "Bepco" molded terminal block eliminates need for wrapping wires around studs or applying terminals to wire ends. They are provided with compression type solderless units, each capable of receiving wires from No. 16 to 6 AWG. Typical combinations which may be accommodated by a single terminal are two No. 10, two No. 12 or two No. 14; one No. 12 with one No. 10, one No. 12 with one No. 14, etc. These blocks are rated at 35 amperes, 600 volts, and are available in 4, 8 and 12 circuit sizes. Screw-on covers are available. Buchanan Electrical Products Corp., 1290 Central Ave., Hillside, N. J.



Bus Design

A "one-split bus" arrangement for feed-in duct, which reduces voltage drop in the distribution of power over long distances, has been announced. "One-split bus" (A), with halves positioned on either side of other two busses separated by insulator plates, permits close spacing and electrical symmetry. Solid ebonized asbestos insulating plates (B) and (C) totally enclose the busses. In addition, they are impervious to moisture and resistant to arcing. Surge clamps (D) and bolts (F) every 24 inches, give structural and mechanical strength necessary to withstand 50,000 ampere "shorts." Steel channels (E) complete the housing. Applications of feed-in duct include—service entrances from transformer banks to distribution centers; vertical distribution in multiple story buildings; low-drop transmission of large power blocks to utilization area; and supplying of resistance welder and other loads having normally low power factor and high demand with a minimum voltage variation. Available in 1200, 1600, 2000, 3000 and 4000 ampere ratings, 2 and 3 wire single phase. Three phase and four wire service for 600 volts or less. Carries UL approval. Square D Company, 6060 Rivard St., Detroit 11, Mich.

Electrical Laminate

A new series of heavy-duty Fiberglas-reinforced Glastic electrical insulating laminates having all the requirements of high impact Class B insulating plate materials, plus flame resistance, has been announced. These new materials possess a combination of high rigidity, impact strength, arc and flame resistance, heat resistance, and low moisture absorption. Glastic plate materials are available in standard thicknesses from $\frac{1}{32}$ inch to $1\frac{1}{2}$ inch and in standard sheets 36 by 48 inches. Laminated Plastics, Inc., 14838 Euclid Ave., Cleveland 12, Ohio.

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NO. 5020 SHALLOW BOX

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MINIMUM STOCKS

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2. Designed to accommodate all but the largest bodied Duplex Receptacles and Toggle Switches.
3. Color and shape blend attractively with the "Union" line of Handy Box Covers.
4. For use with Nos. 12 and 14 Non-Metallic Sheathed Cable.
5. Installed with standard wiring methods. Thus working parts protected from dust and moisture by two insulating housings.
6. Ideal for farm buildings, garages, attics, basements, etc. Approved by Underwriters' Laboratories, Inc. and R. E. A.

*Obtainable from your regular stock.

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Weatherproof Pigtail Sockets
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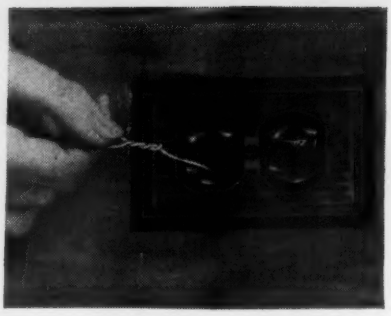
Bakelite Outlet Boxes & Covers
Bakelite Lamp Receptacles
Hay Mow Lighting Fixtures
Pull Chain Lampholders



Receptacle

A new safety receptacle called the SP-49 was designed and built to reduce the possibility of accidental shock and burn caused by inserting small metal parts into electric wall receptacles. It operates in conventional manner, yet makes contact only when standard or polarized caps are inserted, thus providing extra safety for homes with children. Heart of SP049 is four insulated rollers, two of which have to be engaged simultaneously in order to energize unit. Rollers are located within unit to prevent activation with metal objects other than standard cap. There is a strip gauge showing exact amount of insulation to be removed. Either old or new wiring may be inserted into holes in back of receptacle and locked into place by tightening binding screws. Approved by UL. Harvey Hubbell, Inc., Bridgeport, Conn.

Meter

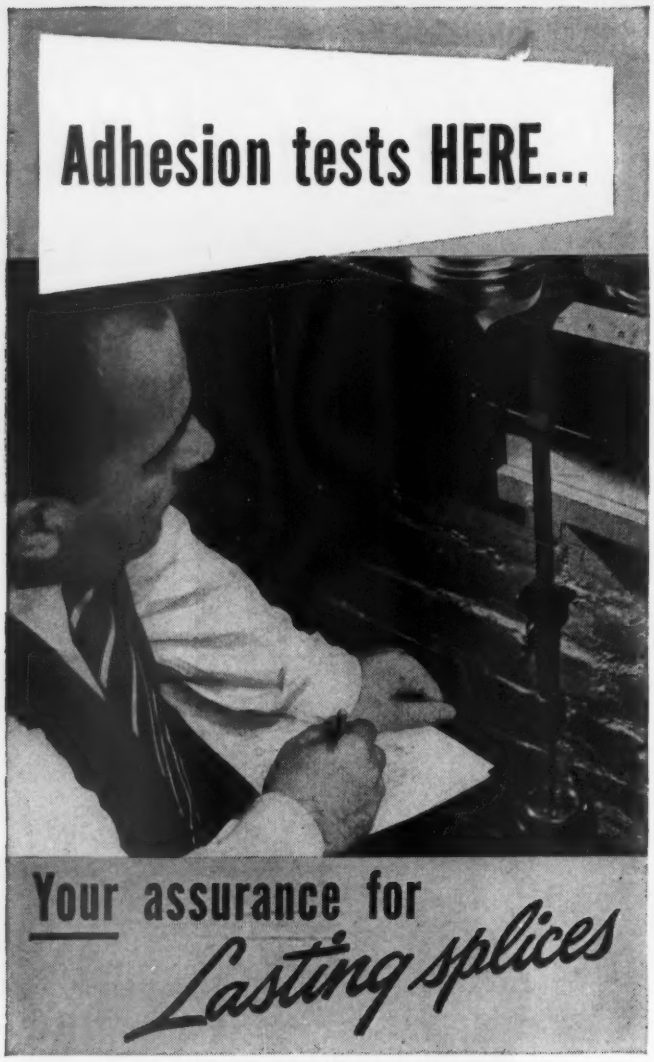
A new combination watthour and thermal kva. demand meter for use by electric utilities having rate structures requiring the measurement of kva. demand has been announced. Designated as Type IHE-1A, the meter is essentially the same size as a conventional watthour meter. It is available in the 50 amp., 240 volt, 3 wire, single phase rating. The watthour meter is essentially the same as the I-50 meter, except that the rotating element is of the conventional ball-bearing type. The

for the First Time HEAT is LICKED!

In the new line of Cutler-Hammer safety switches, the tables are turned. For here is a switch mechanism designed to withstand *safely* any degree of heat that can be expected from correctly selected fuses.

So dependable in performance, so easy to install, so convenient to operate, so attractive in appearance are these Cutler-Hammer safety switches, alert contractors everywhere are featuring them, recommended by Cutler-Hammer wholesalers from coast to coast. **CUTLER-HAMMER, Inc.,** 1300 St. Paul Ave., Milwaukee 1, Wisconsin.

CUTLER-HAMMER
SAFETY SWITCHES
C-H

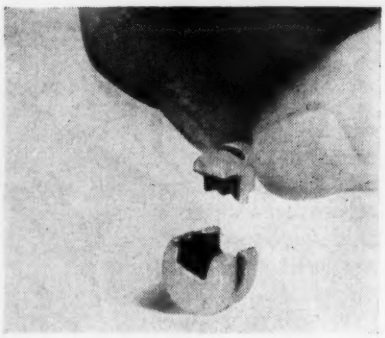


• Friction tape is of value only as long as it stays put on the splices it is protecting. The permanence of PANTHER and DRAGON Friction Tapes is guaranteed by constant checks on adhesion made in accordance with ASTM specifications, as shown above. The extra adhesion built into PANTHER and DRAGON Tapes insures longer splices and complete user satisfaction.

PANTHER and DRAGON Friction Tapes work easily. Splices stay tight in cold as well as warm weather. Sold only through recognized independent wholesalers. The Okonite Company, Passaic, New Jersey.

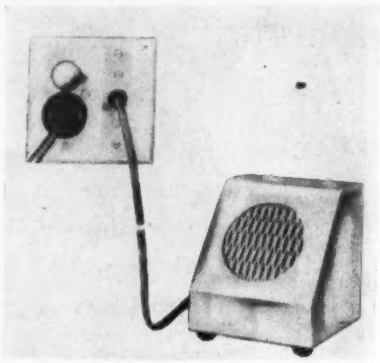
Panther and Dragon
friction and rubber tapes

thermal demand meter unit consists of the thermal unit, a current transformer, a resistance valve, a potential transformer for exciting the heater of the resistance value, and the driving mechanism, pointers and scale. General Electric Co., Schenectady 5, N. Y.



Bushings

Two new Heyco nylon strain relief bushings, No. 2-P and 3-P, have been added to this line. Units accommodate small wires such as clock wire XT-20 and POSJ-64. They are similar in design to the other nine sizes of Heycos. Made from duPont high temperature nylon and are UL listed and approved. They absorb push, pull and torque. Heyman Manufacturing Co., 1200 Michigan Ave., Kenilworth, N. J.

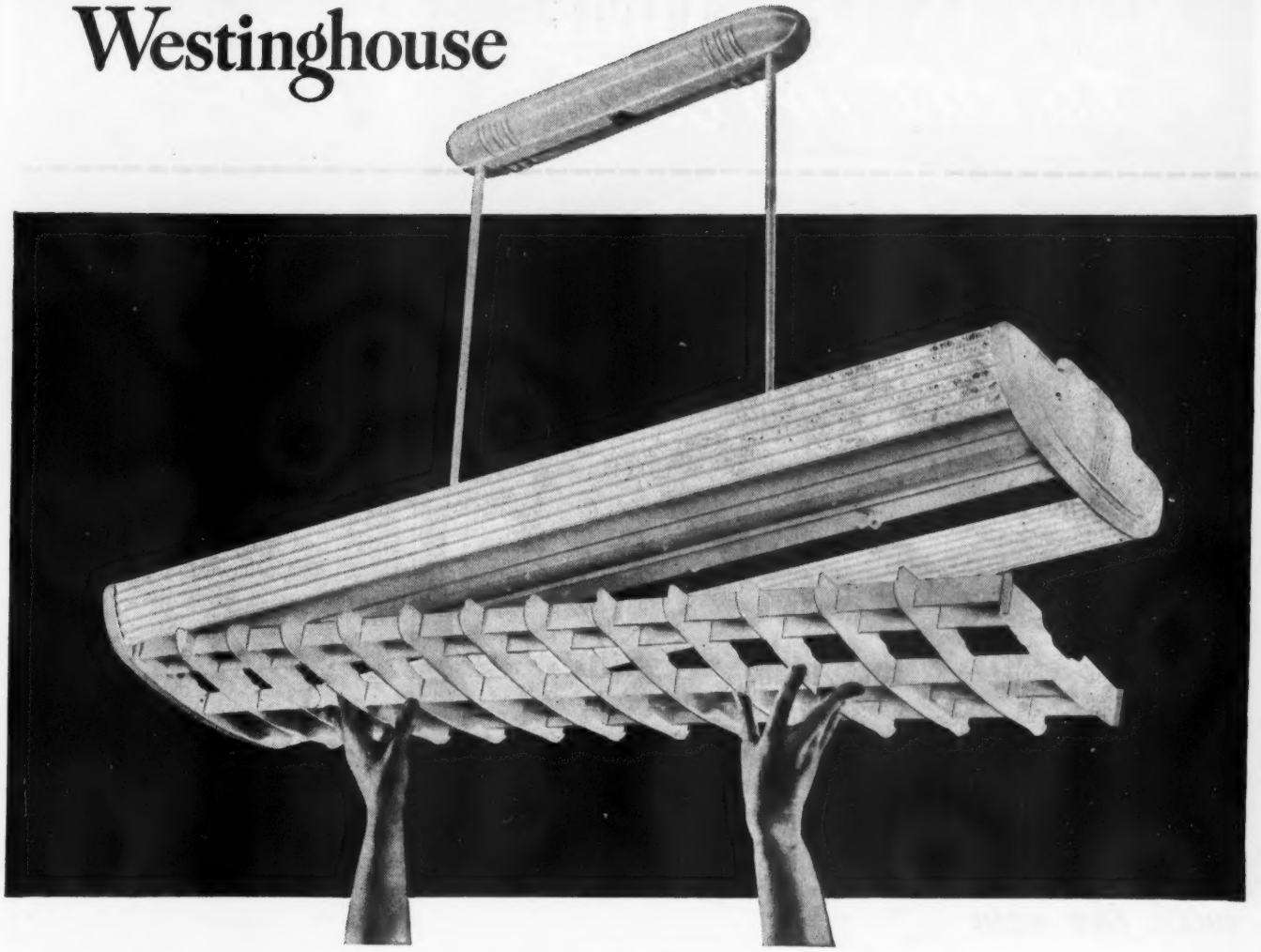


Microphone-Speaker

A portable microphone-speaker, No. 222, has been developed. Placed at the patient's bedside it enables him to communicate at all times with the nurse's control station. It provides two-way voice communication and can also serve as a "Pick-up" for room noises. A privacy switch to cut out the "Pick-up" from the room can be installed in the speaker, if so desired. Unit is made of metal finished in baked white enamel as standard, brown or black also available. Overall size is 5 by 4¼ by 4¼ inches. Equipped with a 6 ft. washable cord. Auth Electric Company, Inc., 34-20 45th Street, Long Island City 1, N. Y.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



installed and removed

IN A JIFFY!

Light weight, CD-80 and CD-160 fluorescent luminaires for schools and offices are easy to handle—quickly installed—easily maintained.

Louvers or plastic bottom panels may be removed in a "jiffy" for routine cleaning—then just as easily replaced. This means full efficiency of the luminaire at all times—and a timesaver for the maintenance man.

This is but one of the many features of the famous CD series, designed especially for schools and offices. Specify Westinghouse to get lasting performance and quality illumination.

To get the complete story, send for B-4072. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. Call or write your local Westinghouse Lighting Engineer. He will gladly help with your planning. J-04255

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PLANNED LIGHTING PAYS

NOW IS THE TIME...

to cut job costs

with the new

SIZE 8U ROTARY ELECTRIC IMPACTOOL

Rated capacity ⅝" bolt size

Not eleven tools to do eleven jobs—but eleven tools in *one*—a real multi-purpose tool—an engineering marvel made possible by the amazing power produced by thousands of rotary impacts.

There is no kick or twist even on the toughest jobs—motor burn-outs are eliminated because the motor continues to run smoothly even if you stall the spindle completely—and you will save time and money on all operations—nut running as much as 90%.

An I-R Impactool pays for itself in 30 days with normal use.

Ask your Ingersoll-Rand distributor for a demonstration,

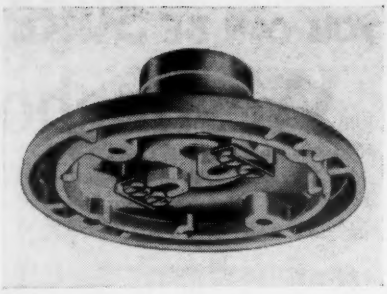
Ingersoll-Rand

11 Broadway, New York 4, N. Y.

ORIGINATOR OF IMPACTOOLS—air and electric

KIT No. 1–IMPACTOOL, with standard equipment, plus a complete assortment of attachments in a Handy De Luxe Case
110 V or 220 V, AC or DC models available

420-18



Lampholder

This plastic keyless lampholder has double terminal screws for continuous wiring, thus eliminating the need for taping and soldering. Molded in one piece, the units fit both 3¼ inch and 4 inch boxes and contain drainage knockouts. Listed by Underwriters' Laboratories with a rating of 660 watt, 250 volt, lampholder meets both Federal and REA Specifications. Comes in brown and ivory. Monowatt Incorporated, 95 Hathaway St., Providence, R. I.

Conduit

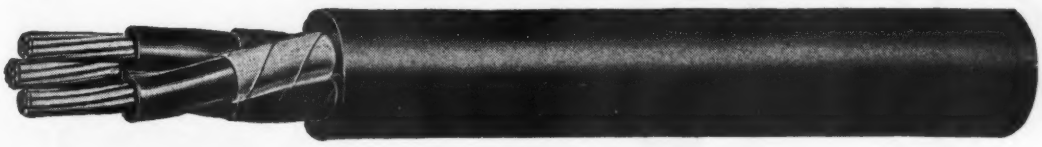
Sealtite electrical wiring conduit consists of flexible, galvanized steel tubing covered with a smooth abrasion resistant, moisture and oil proof protective jacket made from Geon plastic. Developed especially for the machine tool industry, the conduit is moisture and oil tight. Sizes run from ⅜ to 2 in. It is also utilized in such industries as paint manufacturing, chemicals, plastics and textiles, to protect electrical wiring exposed to moisture, oil, acid fumes, chemicals, grease and dirt. American Brass Company, Waterbury, Conn.

Cable

A new Glazon Triex non-metallic sheathed cable has been announced. The Triex construction eliminates customary individual wrapping over each wire, and instead of customary 2/64ths rubber insulation on smaller sizes (14 and 12) 4/64ths inch thickness of rubber is now applied to tinned copper conductors. It provides greater tensile strength, smoother finish, moisture re-

CRESCENT
IMPERVEX TRENCHCABLE

TYPE RR



Your best answer for dependable underground cable at low cost

CRESCENT IMPERVEX TRENCHCABLE is a versatile low-cost, non-metallic armored cable for aerial and direct earth burial installations as well as for use in conduit and ducts, indoors and outdoors. The use of multi-conductor IMPERVEX TRENCHCABLE in place of multi-conductor lead-covered cable not only will show substantial savings in the initial cost of the cable but because of its light weight and ease of installation, splicing and terminating will result in installation economies also. Even greater savings can be obtained when IMPERVEX TRENCHCABLE is used for direct earth burial as it does not require conduit or duct for such installation.

CONSTRUCTION

Insulation on each conductor is CRESCENT IMPERVEX, a special moisture-resisting, heat-resisting, long-life compound possessing excellent dielectric stability in the presence of water. Over the insulation on each conductor is applied a color-coded, moisture-resisting covering. The overall armor is a tough, vulcanized NEOPRENE sheath which completely fills the interstices between the cabled conductors as well as providing a protective sheath over the insulated conductors.

FEATURES

Lighter in weight, more flexible, easier to handle and install than metallic covered cables. No fibrous coverings to rot or deteriorate. The NEOPRENE armor is flame-retarding, resistant to impact, abrasion, grease, oils, ground water, soil acids and alkalies and practically unaffected by exposure to sunlight, air and weather.

USES

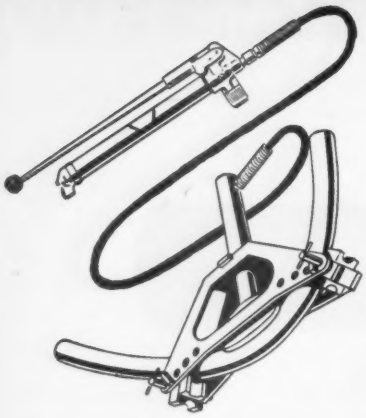
For light and power circuits for industry, utilities, mines, railroads, airports, ball parks, etc.

CRESCENT
WIRE & CABLE

OVER 60 YEARS EXPERIENCE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

A BLACKHAWK PIPE BENDER EARNS 3 WAYS



Your equipment can't produce profit when it's not at work. It's just smart business to choose tools that do a maximum amount of work. A Blackhawk Porto-Power Pipe Bender does MORE than bend pipe. It also uses the spare hours between pipe-bending jobs to do dozens of other profitable shop operations. Buy the pipe bender that does give you "extra" utility — Buy a Blackhawk from your Blackhawk Industrial Supply Distributor.

1

PIPE BENDING—Bends rigid conduit and pipe of all popular diameters. Saves need for elbows, couplings and extra cutting and threading.

2

MAINTENANCE AND PRODUCTION—Special attachments are available for the power unit which push, pull, bend, press, spread, and clamp —pull gears, lift machinery and lick scores of other jobs.

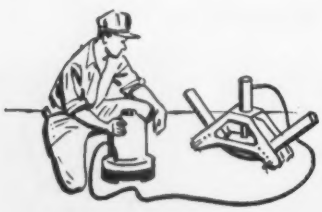
3

SPECIAL JACK—Compact Hydraulic Ram works in all directions—at any angle. A versatile, safe, remotely-controlled jack.

FOR INCREASED PROFITS...YOU CAN NOW CONVERT YOUR HAND-OPERATED PIPE BENDER TO POWER OPERATION

ONE MAN OPERATION

With the amazing new P-182 Electrically-driven hydraulic pump one man can easily bend any size of pipe. Single control knob leaves hands free for measuring, etc. Get full details on the new P-182 from your Blackhawk Industrial Supply Distributor.



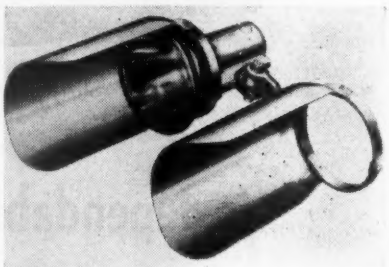
New P-182 Electrically-Driven Hydraulic Pump

Here is a real "profit-package" for you. This simple fast conversion brings you speed, power and greater economy. The P-182 triples ram speeds — slashes pipe bending time — eliminates fatigue. It is a complete package containing pump, reservoir, valves and controls.

A Product of **BLACKHAWK MFG. COMPANY, Dept. P2069, Milwaukee 1, Wisconsin**

BLACKHAWK

sistance, dielectric strength, impact resistance, further protection from fungus and rot, and resistance to fire. Glazon outer covering utilizes an inorganic substance derived from glass, which cannot burn, rot, or corrode; and which is not affected by moisture, sunlight, or strong fumes. Special finish prevents stickiness. Listed by Underwriters' Laboratories for 600 volt service. It is available with two or three conductors, solid or stranded, with or without ground wire, in sizes from No. 14 through No. 4. Triangle Conduit & Cable Co., Inc., 1908 Jersey Ave., New Brunswick, N. J.



Glare Shield

A glare shield for sealed beam lighting is now in production. The new D-200 is made for use with Stonco's entire redesigned line of lampholders. Built of cast and stamped aluminum, unit is of weather-proof construction. It is designed to eliminate spillage to neighboring locations such as windows, etc. and to cut off light when units are aimed at buildings, driveways, sign boards, etc. Fastened to outer flange by a series of lugs and a set screw, it may be rotated to any side of lampholder. Stone Manufacturing Co., Elizabeth, N. J.

Battery Charger

Announcement has been made of the redesigning of Type S single-circuit battery charger for servicing batteries of motive-power industrial electric trucks. To operate, connect battery to charger, snap toggle switch to "On" and push white button on charge-control unit for lead batteries or set ampere-hour meter for Edison batteries. Automatically the charging current begins at proper value; charging current is controlled throughout charge; equipment shuts down in case of power failure; when power is restored, charging resumes; charger shuts down when battery is fully charged. Electric Products Company, 1725 Clarkstone Road, Cleveland 12, Ohio.

[Continued on page 148]

ADEQUATE WIRING SERVES AND SAVES

RoFlex

ROME'S NEW NON-METALLIC SHEATHED CABLE

Meets All Requirements of the Man on the Job

Underwriters' Approved for 60° C operation under the '47 National Electrical Code.

- **EASY TO WORK**
- **EASY TO STRIP**
- **LIGHT WEIGHT**
- **SAVES TIME**

Yes, RoFlex Non-Metallic Sheathed Cable, is easy to strip, light weight, uniformly small in diameter, and clean to handle . . . the kind of "flex" the electrician calls "easy to work." Further, step by step, it is constructed for low cost and trouble-free installation.

CHECK THESE FEATURES FOR YOURSELF:

1. The thermoplastic insulated conductors strip easily leaving bright, clean copper for quick connection. The insulation is highly resistant to oils, acids, moisture, flame . . . is permanently colored for quick and easy circuit identification.

2. A spiral wrap of specially treated paper covering each conductor provides light-weight, durable protection against mechanical injury . . . yet, strips back easily.

3. Impregnated jute fillers in each valley give the finished cable increased longitudinal strength, and serve as "rip-cord" for stripping outer braid.

4. The outer cotton braid is flame and moisture resistant. The uniformly small diameter saves space in outlet boxes and fits smaller holes.

Add them all up and you have a cable that is easy to handle and quick to install . . . the result is savings for you. Remember the name . . . RoFlex.

FROM BAR TO FINISHED WIRE

ROME CABLE CORPORATION

ROME • NEW YORK

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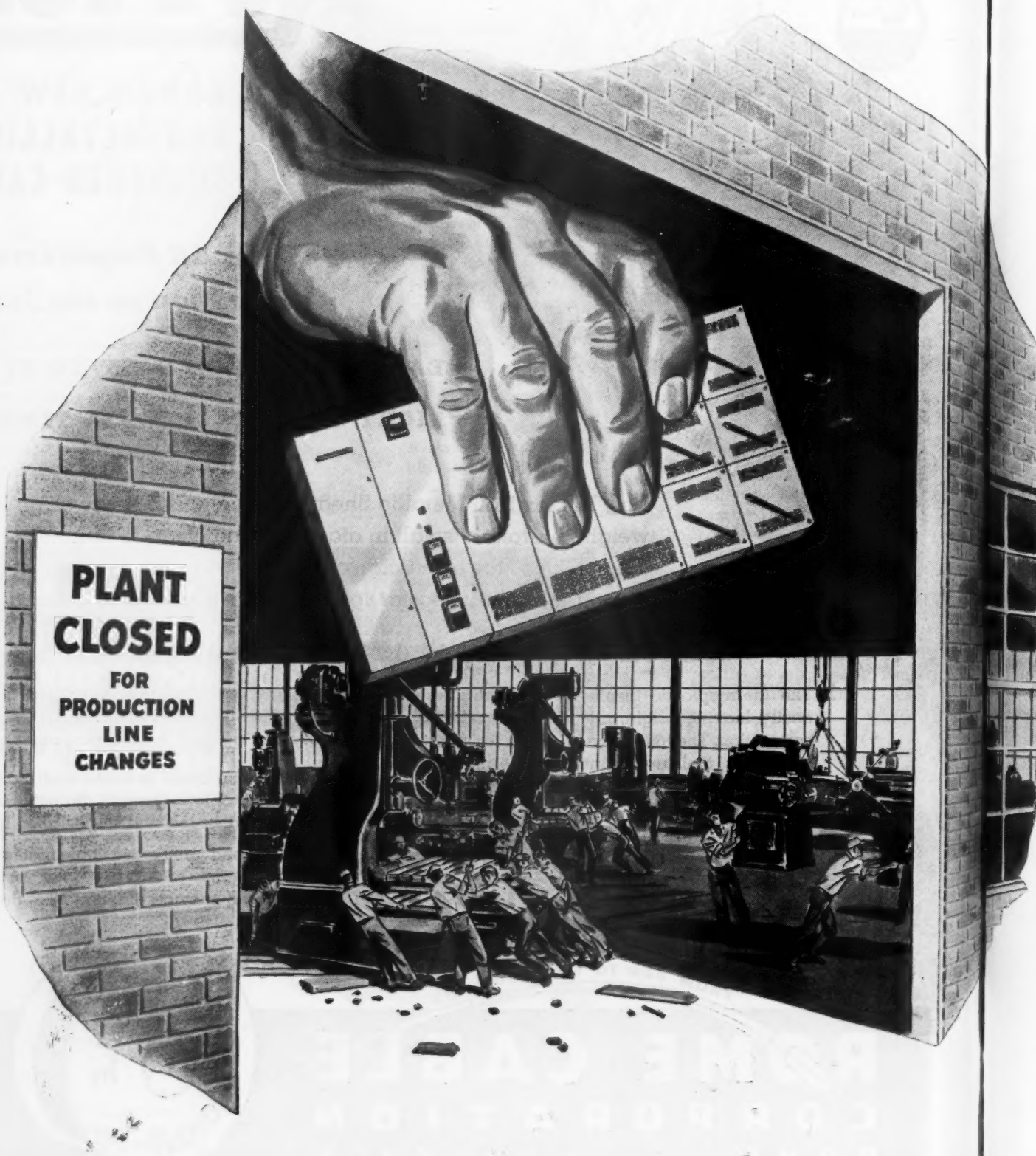

IT'S EASIER!

if you plan your power distribution system first

Eliminate plant shutdowns due to power system changes. Realize new plant economies!

Plan your Power System *before* you set up your new production areas. Choose the "one best" system that answers *all* of your power requirements.

It may not be the system with the lowest initial investment. *But,* it will prove to be the lowest in cost *over a period of years.*

Remember—production records are set *only* if your power system can handle the load. The problem of selecting such a system varies. BUT . . . *Westinghouse can help you find YOUR answers!*

We have worked in close co-operation with *all types* of industries. This wide application experience has given us an intimate knowledge of every phase of power distribution and applications.

CONSULT WESTINGHOUSE . . . and get real help in adapting distribution systems to *your* specific problems. J-94789

If you're expanding or building a new production area . . . get this invaluable information NOW!

1. A New 34-Page Booklet: "Industrial Plant Distribution System", B-4045. Fact-filled pages and colorful diagrams present the basic systems most widely used in industry today. Find how to choose the *best system* for *your* plant.

2. System Selector: A wealth of information condensed to a pocket-size selector! In a matter of minutes you can make preliminary estimates on the system that answers *your* requirements. Ask for SA-6116.

3. Color Movie: Get all the facts visually! This 16mm full-color movie is a 20-minute dramatization that will point the way to new economies in plant power distribution. Ask one of our representatives for a free showing of "The Right Power Distribution System". No obligation, of course.

Call your nearest Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

Westinghouse

SYSTEM PLANNING SERVICE

1 SIMPLE DESIGN with 9 IMPORTANT ADVANTAGES meets 10 CABLE REQUIREMENTS

HAZARD'S VERSATILE HAZASHEATH

CABLE DESIGN

a Hazaloy-coated conductors prevent corrosion.

b Hazard Watertite Submarine Insulation is a rich, rubber compound, formulated especially by Hazard to assure superior service in moist locations. Strong, resilient and moisture-resistant, it has proved its durability and dependability for over 20 years under the toughest operating conditions.

c Hazaprene Sheath is applied in a single layer and uniformly vulcanized to provide a tough, resilient, long-lived protective covering. Made with neoprene, Hazaprene successfully withstands sunlight, weather, moisture, acids, chemicals, etc.

ADVANTAGES

1 No ducts required when buried
2 Light in weight
3 Flexible
4 Economical
5 Wear-resistant
6 Flame-resistant
7 Easy to install
8 Simple to splice and terminate
9 No magnetic sheath losses

APPLICATIONS

1 Series street lighting
2 Airport lighting
3 Industrial power lines
4 Underground distribution
5 Building entrances
6 Rural wiring
7 Highway lighting
8 Municipal signal wiring
9 Bridge wiring
10 Athletic field lighting

Whether buried direct, run in ducts, or strung overhead, Hazasheath has all the necessary protection built in so that safe, trouble-free, long-lived circuits are assured. For all the facts about this outstanding Hazard cable, write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

7477

insulated wires and cables for every electrical use

NEW LITERATURE

Latest catalogs and bulletins of manufacturers are available to you without cost through this Electrical Construction and Maintenance Reader Service

(1) METALLIC RECTIFIERS — Discussion with diagrams, photographs and specifications refers to protection for underground structures in 8-page 2-color booklet. Westinghouse Electric Corp.

(2) V-BELTS — Design and selection data for V-Belts, including sections for multiple drives, fractional horsepower applications, sheaves and open-end belting, is contained in 100-page 3-color booklet. United States Rubber Co.

(3) ADJUSTABLE TROFFER — Line of lighting fixtures including lenses and louvres that can be aligned after installation with definite time savings is presented in liberally-illustrated booklet 480. Smithcraft Lighting Division.

(4) LOW-VOLTAGE SWITCHGEAR — Metal-enclosed switchgear and draw-out circuit breakers for low voltage installations are described in bulletin 18B6376A. Allis-Chalmers.

(5) WIRING DEVICES — Switches, sockets, plates, plugs, taps, outlets, receptacles and accessory parts are cataloged, pictured, specified and discussed. Slater Electric and Mfg. Co.

(6) INTERCOMMUNICATION — Bulletin 155 presents telephone systems recommended for homes, offices, schools, hotels, stores, institutions and industry. Auth Electric Co.

(7) ELECTRICAL CONNECTIONS—Cadweld process for welding copper to either steel or copper without outside source of heat is well illustrated and described. Electric Railway Improvement Co.

(8) BALLASTS — GET-922-B is 20-page illustrated bulletin giving complete information on installation, operation and testing of ballasts for fluorescent lamps. General Electric Co.

(9) CAPACITORS — Pole-type capacitors, with detail drawings, mounting brackets, phantom sketches and descriptive information is contained in catalog 145 PF. Cornell-Dubilier Elec. Corp.

(10) LOCKING CONNECTIONS—Midget automatic locking plugs, receptacles and cord connectors for commercial and industrial applications are subject of bulletin EL-49. Russell and Stoll Co., Inc.

(11) MOTORS — Single-phase motors for belt drive fans and blowers are pictured and specified in 4-color file folder SD 112. A. O. Smith Corp.

(12) INSULATING TAPE — Self-bonding electrical tape, with discussion on properties, resistance, applications and procedure is subject of product information sheet BI-SEAL. Bishop Gutta-Percha Co.

(13) LAMPS AND FIXTURES — Cold cathode lamps and fixtures, showing detailed sketches and installation pictures, are presented in file folder. Colonial Electric Products, Inc.

(14) HOLE SAWS—Complete line of hole saws, blades and parts is described in 6-page catalog-price list. Misener Mfg. Co.

(15) THREAD CLEANER—Tool for renewing rusted and damaged threads, designed for any pitch and either direction, is discussed on form 702. Buckingham Mfg. Co., Inc.

HOW TO ORDER—Two post cards are printed here. On each is room for you to request four pieces of literature. If you are requesting four pieces or less, please use only the bottom card. For five to eight pieces use both cards.

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New York 18, N. Y.

(16) SWITCHBOARDS — Standardized switchboards for servicenters, distribution sections and motor control sections are included in 20-page booklet 31-D-2. Square D Company.

(17) LIGHTNING ARRESTERS—Distribution arresters for low-voltage a-c power circuits and secondary services, including thyrite protectors and pellet protectors and arresters are discussed in GEA-2977B. General Electric Co.

(18) GENERATORS — Switchboardless generators, rubber mounted and compact, separately excited and with automatic voltage regulation, are on file sheet 11248. Kato Engineering Co.

(19) ANNUNCIATORS — Supervisory annunciators of the bullseye lamp, manual reset, illuminated stencil and specially designed types, are contained in illustrated bulletin 120. Auth Elec. Co., Inc.

(20) PRICE SHEET—Reels for many applications, joist boring machines and knockout trimmers are described and priced. HyKon Mfg. Co.

(21) CONTROL DEVICES—Catalog contains over 200 pages, giving full description of resistors, rheostats, relays, contactors, motor starters and controllers. Ward Leonard Elec. Co.

(22) ACCENT LIGHTING — Bulletins 14A and 123 give full data on recessed ceiling fixtures, clamp-on, screw-on and portable incandescent spot lights with variety of housings, louvres and color filters for many applications. Swivelier Co., Inc.

(23) LOADCENTERS—New design features and advantages over fused equipment for home and farm use are discussed in 4-page leaflet, "MO-2 and MO-4 Multibreaker Loadcenters". Westinghouse Elec. Corp.

(24) SCHOOL LIGHTING — "It Happened in Denver's Schools" is a case history of installing planned lighting in actual schoolrooms. All design data are included. School Lighting Division, Day-Brite Lighting Inc.

(25) FIXTURE PRICES — Description and prices on incandescent and fluorescent fixtures are contained in price-sheet. Lenses, louvres, mounting details and ornamental details are sketched. Gruber Brothers, Inc.

(26) TRANSFORMERS — Outdoor potential transformers, dry type, 4800 or 2400 to 120 volts, are presented in GEC-448. General Electric Co.

(27) GENERATOR SWITCHGEAR — Single and paralleled generator switchgear are described in 12-page 2-color booklet 4200-PRD-194. Electric Machinery Mfg. Co.

(28) WIRING DEVICES — Catalog 49 is 64-page presentation of full line of wiring devices. Sketches of items and utilization ideas are included. Pass & Seymour Inc.

(29) WOOD WEDGES — Hard maple wedges for all electrical wedging applications are outlined, dimensioned and discussed in file folder. Inmanco.

(30) TUBING AND SLEEVING — Four-page folder describing varnished tubings and saturated sleevings includes sections on cotton, varnished glass and silicone treated glass. Insulation Manufacturers Corp.

(31) STUD WELDING — Pictures and description show installation methods and applications for welding studs, eliminating drilling, tapping and hand welding. Nelson Stud Welding.

(32) POLE TRANSFORMER — Distribution transformer is discussed as to construction, purpose and use; including pictures and drawings, text and data. Pennsylvania Transformer Co.

(33) MOTOR GENERATOR — Bulletin 221 discusses m-g battery-charging equipment. The Electric Products Co.

(34) TIMING DEVICES — Two-color 20-page catalog presents line of synchronous timing motors, chart drives, timing devices and clock movements for battery charging, control, defrosting, alarms, resets and delay units. Haydon Mfg. Co., Inc.

(35) INSULATION TESTING—Time-saving selection chart includes 10 Megger instrument types. Bulletin 21-05-6. James G. Biddle Co.

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RACO has 3 important Friends for good Reasons

...Architects

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...Jobbers

1. QUALITY—RACO boxes are constantly inspected—therefore, dimensions are true—tapped holes are exact—k'o's are clean—the finish, whether black or galvanized, gives maximum protection.

2. DEPENDABILITY—RACO materials are approved by Underwriters! Every box goes into the job. Brackets are secure, the clamps hold, and devices are easily and securely installed.

3. COMPLETENESS—RACO supplies a complete, practical line of boxes and covers, at all times for both commercial and home wiring.

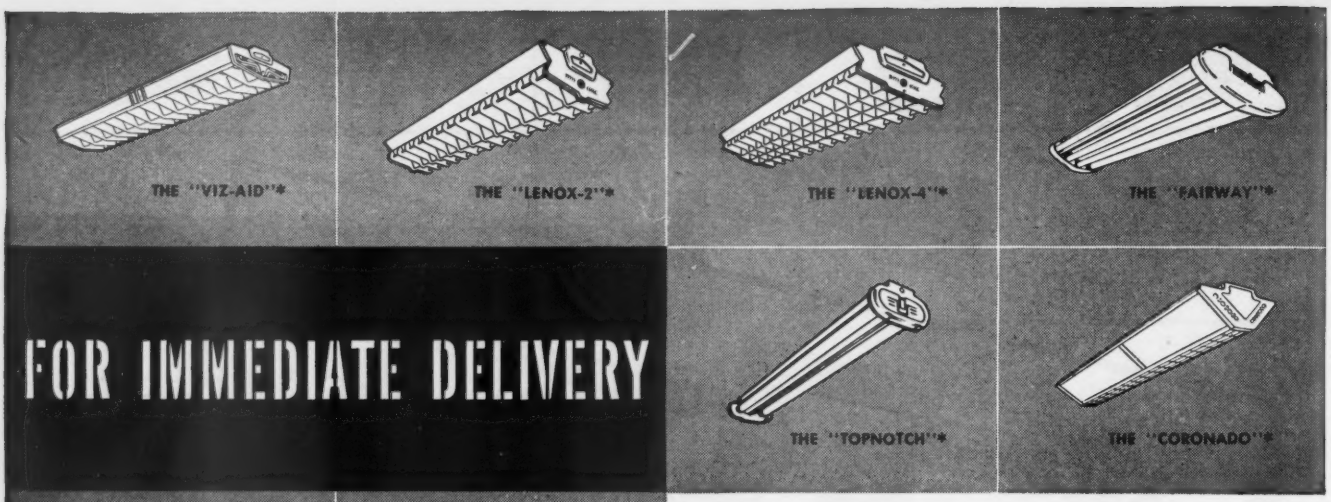
You can always rely on RACO!

RACO

ALL-STEEL PRODUCTS

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"



THE COMPLETE DAY-BRITE LINE AS NEAR AS YOUR WHOLESALER

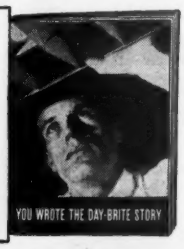
Add *immediate delivery* to the long list of Day-Brite advantages.

Distributed only through leading electrical suppliers, the complete Day-Brite line is *in stock* for your day-to-day convenience. Plant production is geared to give you unusually prompt delivery on large orders, too.

See your Day-Brite distributor or representative. Specify guaranteed Day-Brite fixtures for more profitable installations, for greater customer satisfaction. for *immediate delivery.*

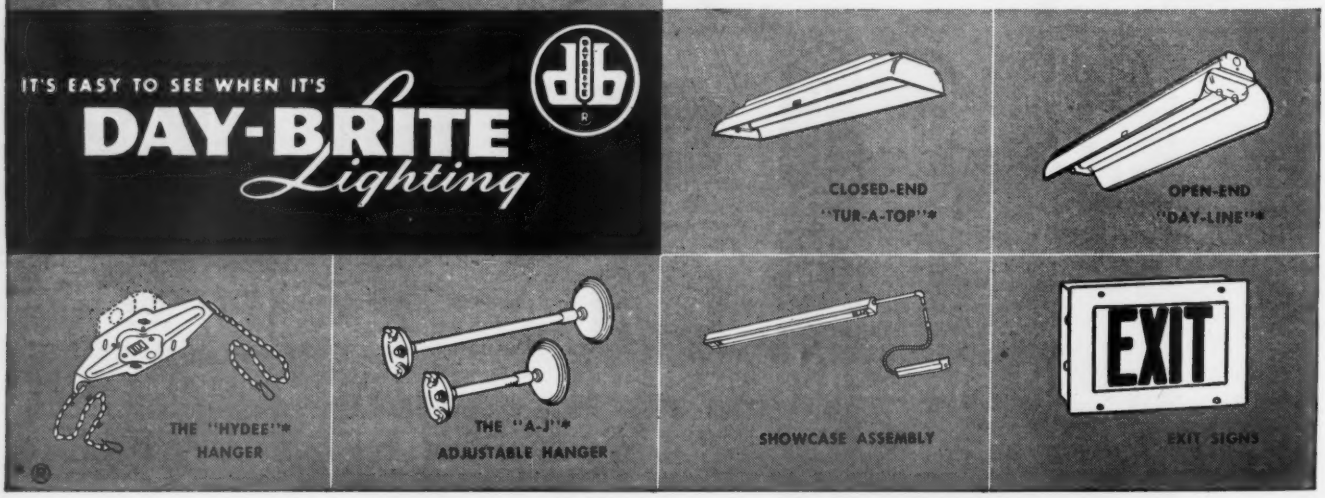
DO YOU HAVE YOUR FREE COPY OF "YOU WROTE THE DAY-BRITE STORY"?

It's yours for the asking—how and why you influence the engineering and construction of Day-Brite fixtures. Write for your free copy TODAY.

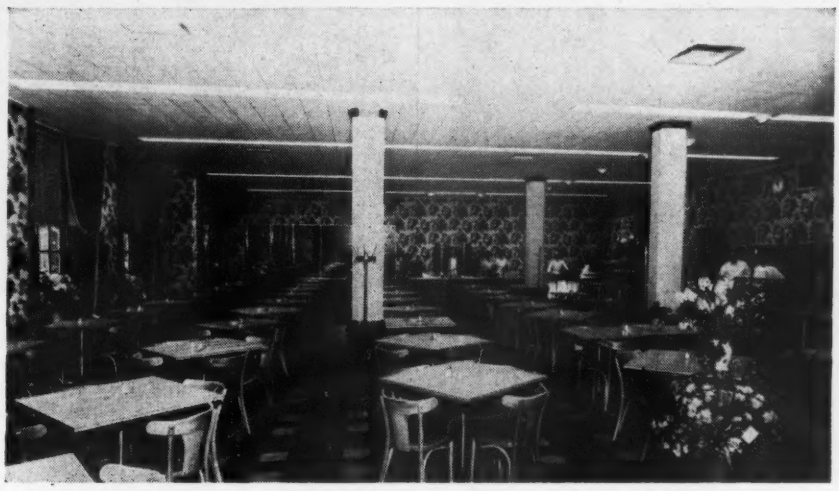


Day-Brite Lighting, Inc., 5402 Bulwer Avenue, St. Louis 7, Missouri
In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario.

209



Modern Lighting



Recessed fluorescent troffers are mounted on 10-foot centers for general illumination. Adjustable 150-watt PAR-38 floodlamps are installed above steam tables and service counters for accent illumination on food. Levels of illumination above 36 footcandles were measured after 1800 hours of service.

Cafeteria Gains Light Accent

One of the secrets of successful cafeteria operation is attracting the eye and stimulating the appetite with appealing dishes, displayed in an attractive atmosphere beneath light of proper color and intensity. At the Home Dairy Cafeteria in Saginaw, Michigan, light sells while taste tells of good food. The cafeteria, 71 by 58 feet with a 12-foot ceiling, utilizes both incandescent and fluorescent units. Incandescent units are Guth Hy-Liters employing 150-watt PAR-38 flood type lamps which can be swivelled in their mountings and directed towards serving areas or table tops for high intensity illumination. Fluorescent fixtures, also manufactured by Edwin F. Guth, are 2- and 3-lamp 40-watt troffers, recessed in continuous or broken rows, or as single units between incandescent assemblies. Fluorescent rows are spaced on 10-foot centers while incandescent lights are located 5-feet apart over steam tables and self-service display counters. After 1800 hours of service, average light meter readings revealed intensities of 36 footcandles throughout the dining area and higher levels beneath the Hy-Liters. The lighting plan was created by Earl Domoney, Consumer Power Company, Saginaw. Acoustical ceilings, tastefully-selected drapes and wall coverings complete the inviting decorative theme.

Coves Create Pleasing Effects

Extensive use has been made of various cove lighting treatments in the new Casual Shop of Jay Thorpe in New York City. Included among these treatments are overhead and border strips in the recessed dress and coat display cases, a continuous ceiling-lighting concealed installation around the upper limits of all walls, and edge lighting behind the dropped ceiling section which illuminates the under side of the rear balcony. With these treatments, clothing is attractively presented for inspection and a decorative atmosphere is created by using lighting as a functional architectural tool. Additional illumination is obtained throughout the shop by incandescent downlights which add warmth to the overall color scheme. The entire interior, created by Raymond Loewy Associates, combines plain and vertically ribbed wooden walls, blending painted areas and contrasting paper coverings.

Industrial designers, Raymond Loewy Associates, use border lighting as an architectural and decorative tool in creating the pleasing interior of the Jay Thorpe Casual Shop in New York City. Warmth of color and added illumination is achieved by a supplementary installation of incandescent downlighting.

Down- and Cross-Lighting For Church Illumination

An effective relighting installation in the Saint Francis Xavier Church of Saint Louis, Missouri, dramatically reveals a stately and beautiful interior which previously had remained unappreciated in comparative darkness. For the eyes of worshippers formerly were lowered to avoid the glare from the unshielded lamps which surrounded the original ornamental hanging lumi-

New-100% Oil and Grease-proof Deluxe Service Light

Convenience Outlet Built into Moulded Bakelite Handle

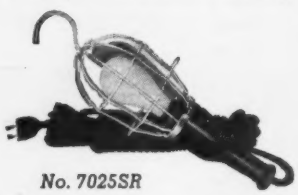
25' Vinyl Thermoplastic Cord and Plug

Now you can have an *Underwriters' Approved* portable Service Light with a convenience outlet built in the handle. The Bakelite handle is non-conductive, heat and impact resisting. The complete assembly is designed to resist oils, greases, acids, flame, moisture and abrasion. Each unit is equipped with 25' or 50'* of tough and pliable Vinyl Thermoplastic cord and plug for long life. The rugged steel wire cage is plated for extra wear and designed with exclusive No-Rol feature. The 5025 De-luxe Service Light is entirely new in portable lighting and gives exceptional service on many uses, especially in garages, maintenance departments and machine shops. Write for data today!

*50' cord is No. 5050.

TWO OTHER PORTABLE SERVICE LIGHTS WITH THERMOPLASTIC CORD AND PLUG

Based on 44 years of experience and popular demand two additional models of McGill Lamp Guards have been added to the line of complete assembly service lights. The Vinyl Thermoplastic cord and plug is tough and pliable and resists oils, greases and other hard usage. All models have strong, zinc plated steel No-Rol cages. They are finished with or without reflectors and LEVOLIER switches. No. 7025 is equipped with moulded rubber handle, No. 8025 with polished hard wood handle. Either may be supplied with 25' or 50' cord. (50' cord is No. 7050 and 8050.)



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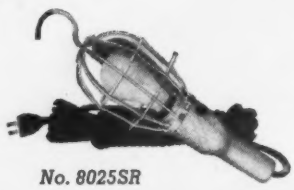
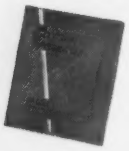


No. 8025SR

"AVAILABLE FROM YOUR ELECTRICAL WHOLESALER"

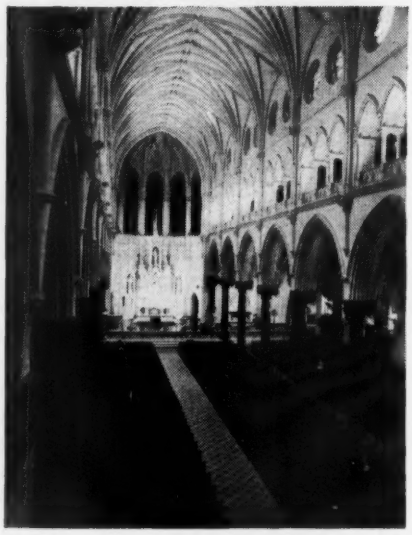


For Catalog No. 43 write to McGill Mfg. Co., Inc., 450 N. Campbell St., Valparaiso, Indiana.

McGILL
TRADE MARK
electrical specialties

ONLY McGILL MAKES Levolier SWITCHES

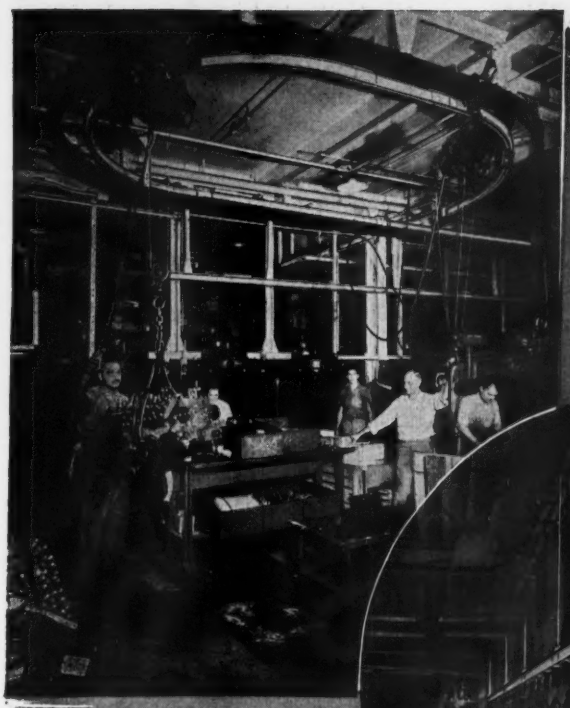
Prior to the installation of a modern lighting plan, upper walls and arch details were hidden by comparative darkness. Objectionable glare resulted from unshielded lamps mounted on ornamental aisle lanterns and insufficient illumination made it difficult for worshippers to follow the service in their hymnals and prayer books.



Rambusch Downlites installed in the ceiling of the nave, side aisles and transepts produce averages of 10 footcandles of shadowless illumination on aisles and pews. Reflector flood lamps mounted in the triforium galleries illuminate upper walls and arches. Reflector floods and spot lights behind sanctuary valance highlight the altar.

naires positioned between the massive side columns. Architectural design and fine craftsmanship in the upper structure remained lost to view, and worshippers found it difficult to read hymnals and prayer books unless they were seated near the outside aisles where shadows were minimized and light levels were relatively high.

The present lighting treatment has eliminated shadows, has created an even distribution of moderate-intensity illumination, and has revealed the formerly-hidden details of a beautiful

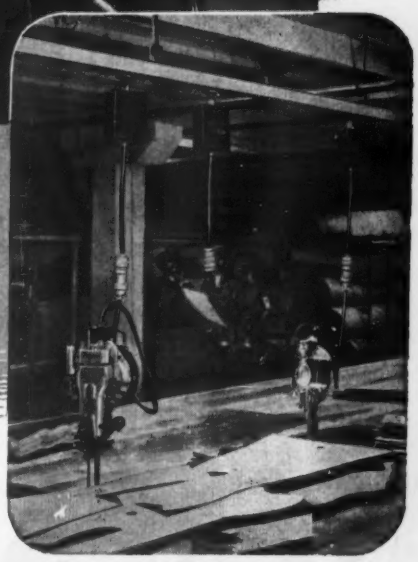


Overhead

On Test

On the Production Line

On the Bench



IF IT MOVES *it should be* FEEDRAIL

Ask any electrical maintenance man. He will say half his time is consumed in the repair of loose or exposed wires, and broken or faulty connections. Ask any safety man. He knows moving electrical equipment is one of the worst hazards in the plant.

Then install Electric Feedrail, the modern, totally enclosed electric distribution system. Watch men work with portable tools connected to the overhead trolley with Ever-Lok trouble-proof connectors. See what it does for moving test lines, lights, cranes and hoists. Everywhere it speeds production, saves maintenance, and reduces electrical hazards.

You can see what it is doing for others by asking for the New Feedrail Catalog No. 20, 32 pages, more than 100 illustrations, diagrams and specification data. Write for your copy to-day.

26

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

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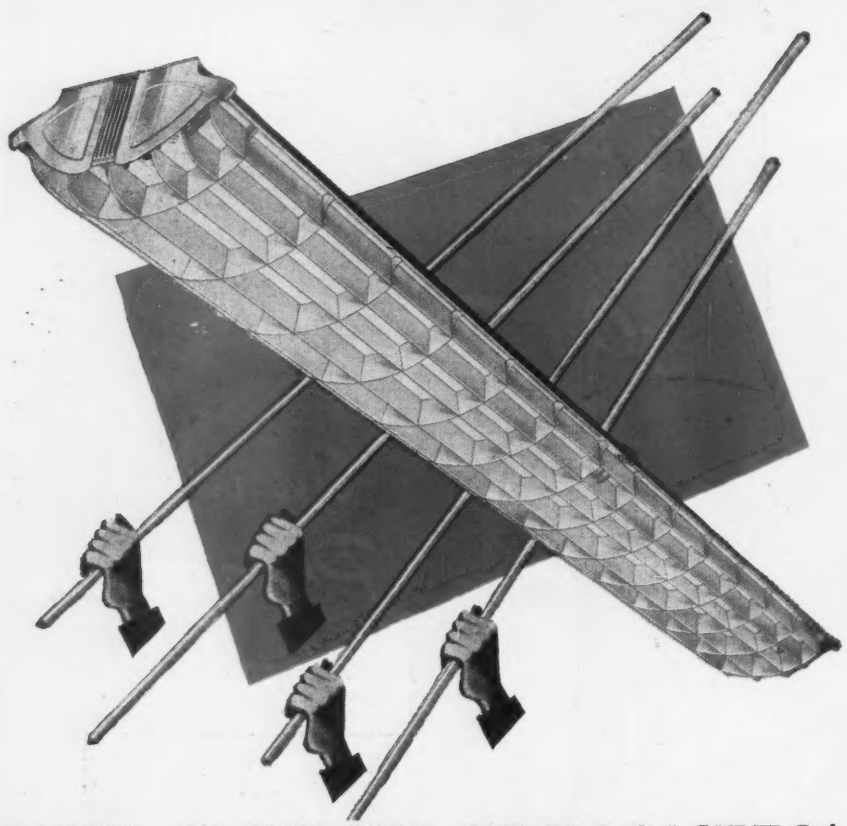


GUTH SLIMLINE TRUCOLITES*

with the New 75W Slimline Lamps Open a New Lighting Sales Horizon!

The new 75W T-12 Slimline Lamps produce more lumens per foot! The new **Guth Slimline Trucolite** delivers more of these extra lumens to the working area.

Its reflector is a time-tested, superior light producer—the first Slimline fixture with downlight reflectors for maximum footcandle results.

It is easy to install—even one man can do it! It is versatile, for 2 or 4 lamps—for 200, 300 or 425 MA. operation.

Cash in on the profit-packed **Slimline** advertising—send for Bulletin 852-A from

939

Guth LIGHTING

YOUR TEAMMATE IN *precision-planned* LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

*®—U. S. Patent Nos. 122586, 2331774

church. Parishiners can read without eye strain and can look upwards without being troubled by extreme brightness ratios.

In physical size, the nave is 35 feet wide with two 19-foot aisles on the sides. Ceiling heights are 65 feet over the center aisle; 32 feet over the side aisles. Interior construction is of stone and light plaster. Flooring is of tile and pews are mahogany stained.

The present lighting plan includes eighteen 1000-watt Rambusch Downlites arranged in pairs and located in the ceiling of the nave. Downlites are positioned 4-feet 8-inches on either side of the ceiling center line and are spaced 18-feet 9-inches apart down the longitudinal axis of the nave. These units produce an even distribution of light on lower walls and provide ample illumination for reading in the nave area. Side aisles are illuminated by special small wedge Downlites, utilizing 300-watt lamps. The shallow design of these units was necessitated by the fact that joist in the triforium gallery above these aisles interferred with the height of the standard fixture.

Upper side walls and nave ceiling arches are illuminated indirectly by R-40 reflector flood lamps installed in Swivelier sockets mounted on a special wire way located in the triforium galleries. Flood lamps are of the 300-watt size and,with three lamps mounted in each main bay, a total of 48 lamps are utilized for this purpose. To obtain even distribution and complete coverage, the R-40 lamps are directed across the nave arch to flood the opposite side of the arch and, to prevent annoyance from source brightness, lamps are positioned below the cut-off angle of the gallery ballustrades.

In the transepts are four 1000-watt Downlites with shovels to direct light primarily to sanctuary walls and the areas adjacent to the altar. The altar proper is illuminated by 150-watt reflector spot and flood lights mounted in swivel sockets installed on special wiring channels situated behind the vertical valance in the sanctuary. Wire ways are 20 feet in length and sockets are positioned on 12-inch centers.

The lighting installation, although modern both in design and application, emphasizes the period architectural treatments incorporated in the initial structure, and highlights the natural beauty of the interior while maintaining the atmosphere of peaceful quiet and sacred reverence.

After four months, average intensities throughout the nave, transept, aisle areas and sanctuary measured 10 footcandles.

The complete lighting plan was created by the Rambusch Decorating Company, New York and installed by Hamp Electric Co., St. Louis.

Why I always use CERTIFIED BALLASTS in fixtures I make!

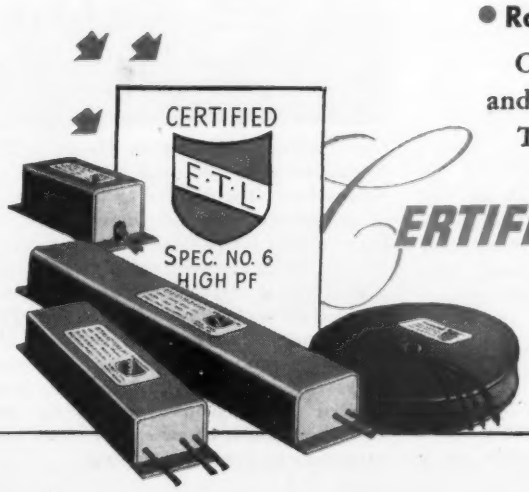
● As a fixture manufacturer, I must have assurance that my complete fixture will be dependable and trouble-free in operation. I can't afford to offer a fixture that doesn't protect wholesalers and contractors and assure greatest satisfaction to the user.

My reputation . . . my business future depend on the performance of the fixtures I make. That's why I always use Certified Ballasts.

Certified Ballasts assure—

- **Full lamp life**
- **Rated light output**
- **Quiet operation**
- **Reliable performance**

Certified Ballasts are made to rigid specifications—then tested and checked by impartial Electrical Testing Laboratories, Inc. That's why I have confidence in Certified Ballasts. You will, too.



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

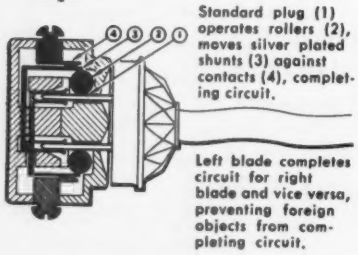
New SAFETY RECEPTACLE

MAKES CONTACT ONLY WHEN STANDARD CAP IS INSERTED

The *SAFETY-PLUS Receptacle

Actual tests prove it to be Safest Receptacle ever designed

- **Makes contact *ONLY* when standard cap is inserted**
- **Conventional operation . . . double contact springs**
- **Back or side wired—shallower for more wire room**
- **Takes polarized or standard caps**


Standard plug (1) operates rollers (2), moves silver plated shunts (3) against contacts (4), completing circuit.
Left blade completes circuit for right blade and vice versa, preventing foreign objects from completing circuit.

Featuring an entirely new principle, the Hubbell SP-49 Receptacle was designed to reduce the possibility of accidental shock and burn, makes contact ONLY when standard caps are inserted! Pins, wires or other foreign objects cannot energize the unit! The SP-49 provides easier wiring, more wire room, back wiring, washer ears, silver plated contact springs, interlocking bridge and takes standard caps.

For descriptive literature write

HARVEY HUBBELL, INC.

Dept. E-1 Bridgeport 1, Conn.

High level lighting is provided on billiard tables at Johnson & Dillon's Billiard and Bowling Hall, Chicago, by a combination of fluorescent and incandescent light sources concealed above a louverall ceiling.

Louverall Lighting For Billiards

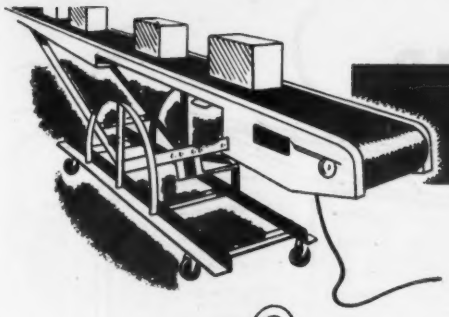
A new lighting technique for the indoor recreational field has been used to light the Johnson & Dillon Billiard & Bowling Hall, Chicago, Ill. It consists of a combination of a louvered ceiling panel fluorescent lighted for general illumination and individual reflector flood lamps for highlighting the billiard tables.

The louvered ceiling panels are continuous from one end of the room to the other, and are the same width as the length of the billiard tables. The louvers are custom built of metal, with an approximate 45-degree shielding angle, and have a baked-on white finish. Continuous rows of 40-watt fluorescent lamps, installed on continuous wireway channel, are located over the louvers. These continuous rows run longitudinally with the louverall panels, and are therefore normal to the length of the billiard tables. The illumination intensity from the fluorescent lamps and louverall ceiling averages about 40 footcandles maintained throughout the room.

In order to step up the lighting intensity on the billiard tables at the point of play, three 150-watt Type R-40 reflector flood lamps are concealed above the louverall ceiling directly over the center of the tables. One lamp is installed over the middle of the table, each of the other two lamps are installed over either end of the table. The light intensity from these incandescent reflector lamps, added to the general fluorescent illumination, builds up a total intensity of more than 70 footcandles maintained over the entire playing area on the tables. Color quality of the resulting illumination is considered most satisfactory.

The walls and floors are fairly light in color, which adds to the lighting efficiency, and presents a very pleasing and modern appearance.

Good school lighting in Berwyn, Ill. begins in this office of the Board of Education. It is lighted to an intensity of approximately 50 footcandles by three 8-foot eight-40 watt lamp fluorescent units of the general diffuse Model 4-40L Plant Products, Inc. type suspended 30 inches from the ceiling. The same unit is used throughout in the grammar school classrooms. The unit is of the louvered bottom type, latch hinged to facilitate relamping and cleaning, and is of all steel welded construction to prevent warping.



HEAVY

It pays to specify General Electric Flamenol® Type SRT cords for heavy-duty electrical equipment such as portable conveyors, air compressors, and pumps, used in garages, packing houses, warehouses, and factories. They're built tough, to take plenty of abrasion and the day-in, day-out beating of hard, rough use.

MEDIUM

You'll get long service life, decreased maintenance, with Flamenol Type SJRT portable cords on such appliances as office machines, floor sanders, commercial cleaners, and similar equipment. The light weight and flexibility of these cords make handling easy.

LIGHT

Use extra-flexible General Electric Flamenol rip cord for portable lamps, fans, and other small devices. The flexibility and neat appearance these rip cords give to appliances pay off in the long run. Smooth, thermoplastic jacket cleans with a quick wipe.

they stay on the job

WHEN EQUIPPED WITH GENERAL ELECTRIC

FLAMENOL

PORTABLE CORDS

You can count on tough, good-looking Flamenol portable cords to give continuous, dependable service under severe operating conditions. Use them to fight the life-shortening hazards that threaten the cords of all portable electrical equipment—hazards such as oils, acids, alkalies, moisture, and sunlight.

Why not give *your* equipment the added advantage of hard-wearing General Electric Flamenol cords? To get more information on these popular, tough cords, write to Section W30-618, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

HE'S DELIVERING ANOTHER LOAD OF CENTRAL RIGID STEEL CONDUIT

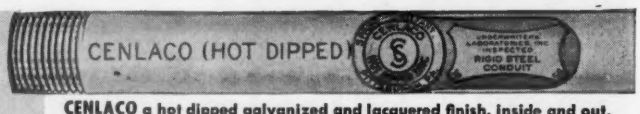
CENTRAL
SPANG
CONDUIT

● Yes, you can depend on your Central Rigid Steel Conduit Distributor for rocket-fast delivery of nearly all the things he has for sale.

What's more you can depend on him for quality products and materials . . . like Central Rigid Steel Conduit. It has always been known for its fine bending, threading and cutting qualities. And the complete stock of Central Black, Cenlaco or Central White Rigid Steel Conduit carried by your distributor, makes it easy for you to get the type of electrical raceway that best suits your requirements.

When you need conduit or other electrical supplies, contact your Central Rigid Steel Conduit Distributor first . . . you'll find that he's a dependable source of supply.

SPANG-CHALFANT
Division of The National Supply Company
General Sales Office: Grant Bldg., Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities



CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

Answered by
F. N. M. SQUIRES and GLENN ROWELL
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

Questions on the Code

Conduit Fittings

Q. *There is some disagreement here over the question of making splices within conduit fittings. Our new inspector has been permitting not more than three splices in these fittings regardless of the size. I do not know just how one can determine the number of cubic inches within and so far have been unable to find anyone who can give us the right information on this. Is this problem covered by the Code?*—A.P.B.

A. Yes, the Code does contain reference to splices within conduit fittings. However, no limitation is specified. Under paragraph c of Section 3709 you will find the following sentence: "The limitations in paragraphs a and b of this section shall not apply to terminal housings supplied with motors, nor to types of boxes or fittings without knockouts and having hubs or recessed parts for terminal bushings and lockouts." This obviously permits splices within conduit fittings and makes it necessary for each inspection authority to determine whether or not the fitting is overcrowded. One can refer to Section 1105, which covers the mechanical execution of the installation whenever evidence of overcrowding is found. Probably a safe rule of thumb to follow is that commonly used by electrical inspectors who accept only installations where the splices can be put in place by hand and refuse to except those where the splices are forced in place by screwing the cover onto the fitting or by other forceful mechanical means.—G.R.

Rural inspection policies are aired by Albert Bartsch (left), president, North Dakota Electrical Contractors Association, Rugby, N. D.; and E. E. Dockter, inspector for the North Dakota State Board of Electricians.

Immersion Heaters

Q. *There have been a great number of immersion type water heaters sold in this area of the type where the element is in direct contact with the water. I know these are dangerous and would like to find some section of the Code which forbids their use, but so far I have been unable to find any such ruling. Do you know of such a section?*—A.D.

A. Section 4233 covers immersion heaters and reads as follows:

"Electric heaters of the portable immersion type shall be so constructed and installed that current carrying parts are effectively insulated from electrical contact with the substance in which immersed."

The immersion heaters with open elements are exceedingly hazardous and their sale and use must be discouraged whenever possible. Numerous instances are on record where they have been responsible for serious injuries, some of which have caused death.—G.R.

Pump Motor Circuit

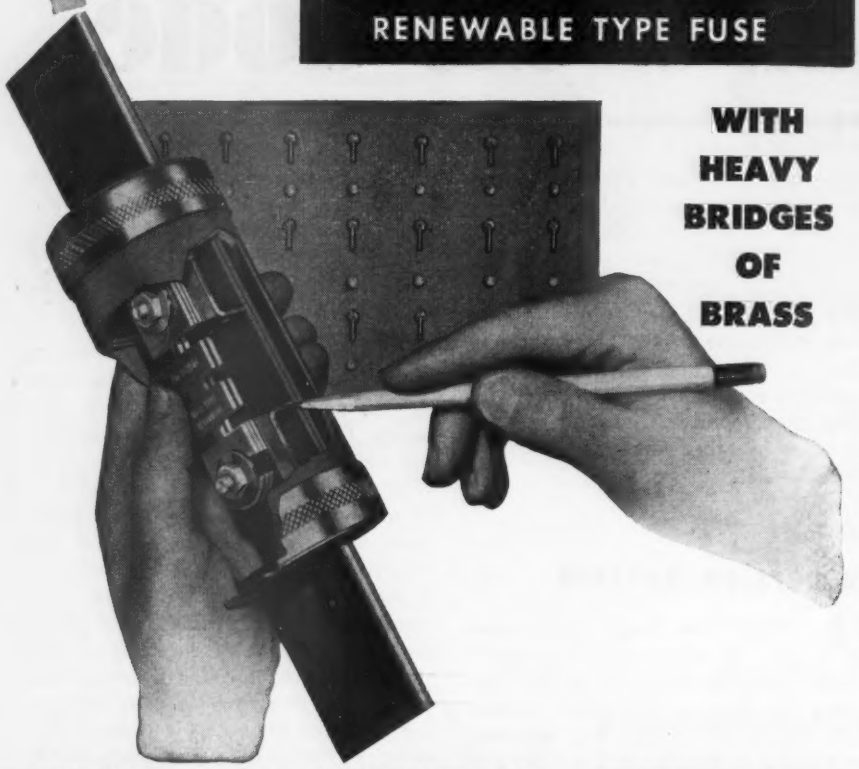
Q. *The local R.E.A. office has questioned the last job we have completed because at the request of the owner we ran a separate service from the meter loop directly to the water pump motor with the only control or disconnect mounted on the wall of the pumphouse. One of the boys has stated that a fault on the circuit anywhere between the meter loop and the pumphouse may cause the transformer fuses to open and therefore the circuit should be taken from the load side of the main disconnect. Is this required?*—M.B.

A. No. Your installation is correct. Section 2321a gives permission to run a separate service to a fire pump. On a farm the well is usually the only source of water and while small, is of utmost value in time of fire. If the pump motor circuit was energized on the load side of the main line switch a fire in any building is likely to cause an electrical fault that may open the main line fuses and shut off the water supply. Hence the circuit should be on the line side of this switch. If a separate switch is provided adjacent to the main service switch, the switch controlling the well pump motor should be clearly identified so no one would open it in attempting to disconnect the electric service to the building on fire. While the R.E.A. employee is correct in his contention, the likelihood of such an occurrence is negligible and merits little consideration when weighed against the need for water during a fire.—G.R.

New members recently appointed by Governor Youngdahl to the Minnesota State Board of Electricity are contractor Don F. Kehne (left) of St. Paul and Martin Streed, chief electrical inspector of the city of Minneapolis. They replace 25 and 10 year men.

NEW

Monarch
HEAVY DUTY
RENEWABLE TYPE FUSE



WITH HEAVY BRIDGES OF BRASS

DESIGNED TO WITHSTAND EXTRA HEAVY OVERLOADS

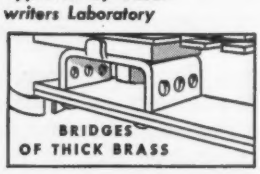
TEMPORARY

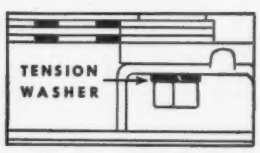
Approved by Underwriters Laboratory

Cool . . Truly Aligned . . Maximum Use of Brass . . . Adding up to Lower Power Waste Than Ever Before! And Here's How!

This new heavy duty fuse incorporates many time-tested Monarch features. The newest, — thick brass bridges widely separating the terminals from the fiber bar and made with ventilating holes—allow ***maximum dissipation of any internal heat.***

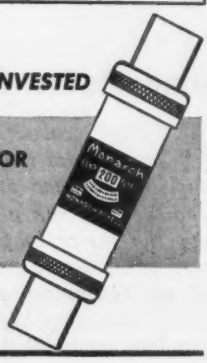
The Monarch method of locking these bridges securely to the terminals and fiber bar, together with Monarch's positive lock construction and compressed tension washers, insures ***permanent true alignment.***





. . . IMPROVED SERVICE PER DOLLAR INVESTED

SPECIFY Monarch FOR SUPERIOR FUSErvice



MONARCH FUSE CO., LTD.
118 E. First Street Jamestown, N. Y.

Contractor licensing is topic of this huddle between: (L to R) George Hilstad, Traill County Electric, Mayville, North Dakota; Harry Edmonds, president, Minnesota State Board of Electricity; and Clyde Kieley, president, North Dakota State Board of Electricians.

Communication System

Q. *I have been asked to approve the installation of a communications unit in a paint and lacquer factory because the units used operate at low voltage. It is my understanding that such devices must be of the Class 1 type and that no ordinary unit regardless of voltage can be used. What is the Code ruling on this?*—D.K.

A. Section 5024 of the N. E. Code contains the following rule:

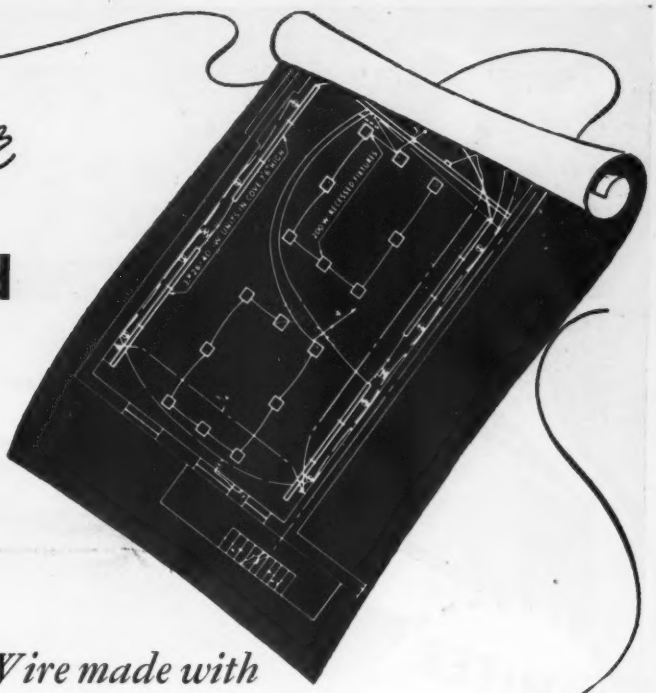
"In Class 1 Division 1 locations all apparatus and equipment of signaling, alarm, remote control and communication systems irrespective of voltage, shall be approved for Class 1 locations, and all wiring shall conform to paragraph a Section 5014 and paragraphs a and c Section 5015."

These paragraphs require the use of rigid conduit and explosion-proof fit-

RECA President, R. E. "Brick" Mattison, Jr., R. E. Mattison & Co., Britton, Oklahoma, was re-elected to head the Rural Electrical Contractors Association at recent Chicago convention.

A Good plan for

INDUSTRIAL and COMMERCIAL WIRING INSTALLATIONS



Use Rubber-Covered Building Wire made with

FIBERGLAS* *Yarns*

EASIER INSTALLATION and LONGER LIFE at NO PREMIUM

For permanence . . . and for customer satisfaction . . . on industrial and commercial wiring installations . . . it's a good plan to use rubber-covered building wire made with Fiberglas glass yarns . . . because Fiberglas yarns:

- **DON'T ROT**
- **DON'T ABSORB MOISTURE**
- **DON'T BURN**
- **DON'T PROVIDE FOOD FOR RODENTS**
- **DO HAVE THE INHERENT CORROSION-RESISTANCE OF GLASS**

For your satisfaction, too, you can depend on Fiberglas yarns to perform to your credit whether you are the architect, the engineer, or the contractor on the job—or the wire manufacturer.

Consider, too, that rubber-covered building wire made with Fiberglas yarns:

- **PULLS EASIER**
- **LASTS LONGER**

Nonmetallic—sheathed building cable made with Fiberglas yarns offers the same advantages.

Consult your supplier and satisfy yourself about the superior performance of building wire and cable made with Fiberglas yarns.

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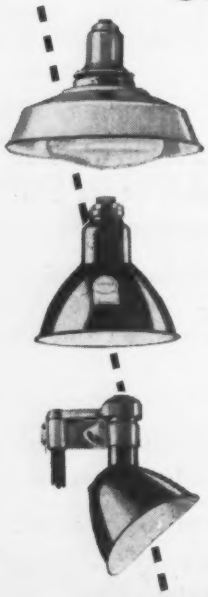
The Importance of
GOOD LIGHTING



The amazing "Whiter than White" Abolite finish adds a NEW brightness, a NEW efficiency factor to the already popular ABOLITE line of fine lighting units. Designed and engineered to provide maximum illumination on working surface areas, ABOLITE achieves complete satisfaction and top performance—yet all so simply.

We call it "engineered seeing" because it directs "more light where you want it".

ABOLITE serves every lighting purpose—a complete line of products for industrial, commercial, floodlighting, and pump island installations. SPECIFY ABOLITE—AND GET THE BEST!
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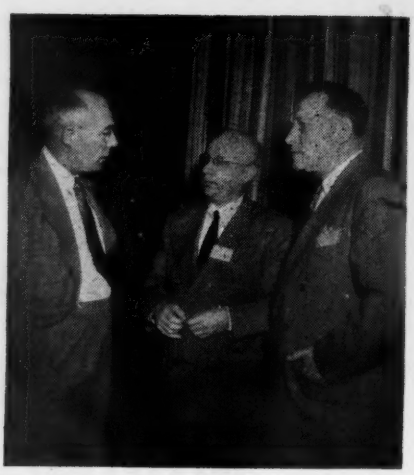
THE JONES METAL PRODUCTS CO., West Lafayette, O.

WHITER THAN WHITE
ABOLITE Lighting

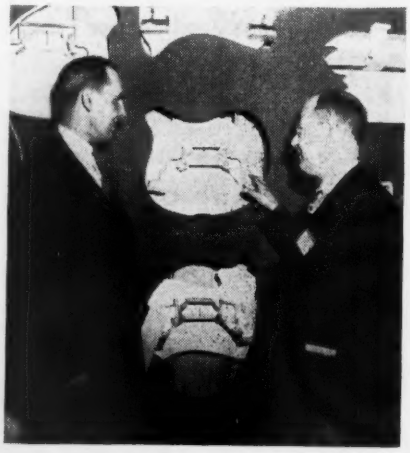


Seeking information on Bureau of Reclamation electrical construction work are Harvey T. Nack (left), White City Electric Co., Chicago; and R. N. Campsey (right), R. N. Campsey Construction Co., Denver, Colorado. Harvey McPhail (center), director of the Bureau's Power Utilization Branch, gives the answers.

tings, cabinets, etc. for all circuits used in connection with such systems if located within Class 1 locations. The average lacquer factory may have a few areas which can be considered as ordinary or as Division 2 locations, but the areas where open stocks are processed or handled must be considered as Division 1 locations as the average flash point of most lacquers is approximately 35 degrees F.—G.R.

Pole Line Tapping

Q. *I am wiring a planer and a resaw mill for a lumber firm and I have nearly finished wiring the planer mill, but I have a question on wiring the resaw mill which I would*



H. W. Noren, Mitby-Sather Co., Minneapolis contractor, gets fixture mounting details from Bob Hamilton, Smithcraft Lighting Div., A. L. Smith Iron Company.

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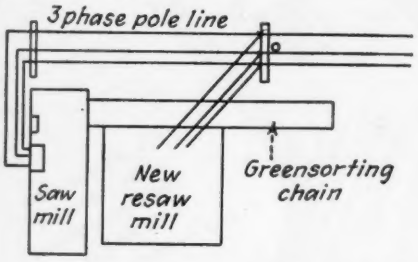
like to have a more qualified person answer for me.

Does the N. E. C. permit or forbid the installment of a main switch and bussed gutter in this new resaw mill?

The resaw mill is attached to the original saw mill which was built several years ago and will feed on to the original green sorting chain. The present electrical panel is nearly fully loaded and to place the switches for the new equipment at the old panel, would require that old panel be revamped and a heavy gutter and a main switch added to it.

Below is a drawing of the old layout showing the old part and the new resaw addition:



Please give me your opinion on this and also any suggestions which you may have. You see the old panel is so arranged that there are three service heads, one entrance goes directly into the head saw disconnect switch, one entrance goes into the gutter main disconnect and one entrance goes directly to the edger disconnect switch.—R.A.W.

A. If the pole line feeder has sufficient carrying capacity to also carry the resaw mill, the Code would permit tapping the pole line as shown. The taps should be of the same size as the wires of the feeder.—F.N.M.S.

Bright future is in store for electrical contractors Ralph J. Berger (left), New England, North Dakota, and Perry Downer, of Roscoe, South Dakota. REA hi-lines are now reaching into the western two-thirds of each state.

Say...

you left your motor running!

Do you run your motor 24 hours a day, every day? That's all right, if it's a Fairbanks-Morse motor, you can leave it on the job and forget about it. Fairbanks-Morse motors are built to take on the toughest assignments, to give the finest, trouble-free service. They require minimum attention . . . they assure lowest maintenance costs. Complete information about the full line of Fairbanks-Morse electric motors is contained in the handy POCKET PANORAMA. Write to Fairbanks, Morse & Co., Chicago 5, Ill.

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In the News

Joint Jurisdictional Settlement Abandoned

After a year of the National Joint Board for settling jurisdictional disputes in the construction industry, the AFL Building and Trades Dept. has given up on it.

At a meeting in Cleveland on May 16, the Building Trades decided to give 30-day notice to the Associated General Contractors, the National Electrical Contractor's Association and seven other specialty contractors that it was exercising its right to terminate the joint plan that went into effect on May 1, 1948.

The Building Trades would set up, instead, a plan which would exclude the contractors. Jurisdictional disputes would be decided by a panel consisting of representatives of the unions involved and an impartial chairman, probably John T. Dunlop. Dunlop is now Chairman under the Joint Board Plan.

The Joint Board has handed down four new jurisdictional decisions, the last one just before the November election, and applied these and existing decisions in settling many other disputes. But there was dissatisfaction. Some unions did not like the decisions. A general feeling that the Taft-Hartley Labor Law would be repealed led some to strike in violation of the joint agreement. There were 91 illegal jurisdictional strikes in the Building Trades during the first four months of this year.

The major bills pending in Congress for revising the Taft-Hartley Law would bolster the jurisdictional disputes section so as to allow NLRB or an arbitrator it selected to decide jurisdictional issues on their merits.

The Taft-Ives Amendments, as well as the administration bills in the House and Senate, would set up this procedure:

Whenever a jurisdictional dispute threatens to result in a work stoppage, the Board may determine the dispute itself, or appoint an arbitrator, after giving the unions a chance to settle it themselves.

In reaching a decision, the Board or arbitrator would take into consideration (1) previous certifications by NLRB, (2) any charters or interunion agreements which define areas of jurisdiction between contending unions, (3) decisions of any agency established by unions to consider such disputes, and (4) past work history of the unions involved.

A weakness in the administration bills is that they would not provide for an injunction to prevent stoppages over jurisdictional issues.

Engineers Study Power Problems

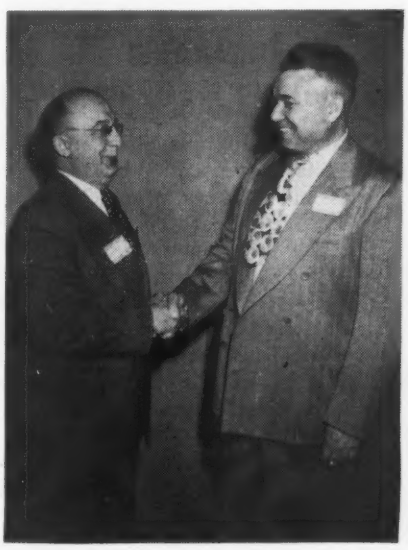
The tremendous growth in the electric power industry, the inherent problems encountered in this expansion and utilization, and a look into the future were general topics of detailed discussion at the recent 11th Annual Midwest Power Conference held at Chicago's Hotel Sherman. Engineers from all over the midwest area attended the three-day conference to hear more than 50 papers presented on the various phases of generation, transmission, distribution, utilization and maintenance.

A glimpse of what lies ahead was given by Federal Power Commission predictions. By 1960, electric energy requirements on utility systems will approach 525 billion kilowatt hours—an 85 percent increase over the 1948 level, E. R. deLuccia, chief of the Power Bureau, revealed. Peak loads will approach 100 million kwhrs. (54 million in 1948) and a 115 million kilowatt power supply will be necessary to serve this load with reasonable reserves. Industrial establishments operating their own generating plants will produce 75 billion kwhrs. in 1960 (54 in 1948) and require 19 million kilowatts of generating capacity, deLuccia added. Power-wise, we are now living a hand-to-mouth existence, he stated. Only solution is to install capacity faster than the load is growing; attain and maintain a 15 percent reserve capacity, he concluded.

From the standpoint of national security, reserve capacity should be built by and made part of operating electric systems, according to Edward Falck, chief consultant on Power and Utilities, National Security Resources Board. Whether constructed by federal agencies, private utilities or municipals, new plant capacity should be interconnected and made part of the area power supply system, he added. The potential utilization of electric power is still far from being fully developed. Falck views concentration on further developments as one of the greatest contributions that can be made to our national security.

Developments in basic system designs and improvements in distribution equipment have made available a number of system choices for industrial distribution, stated H. B. Thacker, Westinghouse Electric Corp. Effectiveness of any distribution system is measured by its flexibility, service continuity, voltage regulation, efficiency, operation and maintenance cost, and the initial investment. Of the nine basic systems presently available, the greatest number of desired system characteristics are obtainable from the following five: Loop-Primary Radial; Primary Selective Radial; Banked-Secondary Radial; Simple Network; Primary-Selective Network. The others include: simple-radial; secondary-selective radial; simple-spot network; and primary-selective spot network. Thacker reviewed the features of each system.

Resonant grounding on the 6600-volt distribution system at the Wright-Patterson Air Force Base at Dayton,



New President of the Minnesota Electrical Inspectors Association, Karl Mertz (left) of St. Paul, receives congratulations from retiring president Harold Bielke of Rochester. Mr. Mertz is superintendent of meters for the Northern States Power Company at St. Paul.

The KNOPP Voltage Tester with the PROD-MOUNT Saves Time, is Reliable!

5 Safety Features . . . Many Uses

Say "Goodbye to risky, time-wasting fuss in testing" with the 5 main safety features in the Knopp Voltage Tester: (1) exclusive Prod-Mounting Socket in housing making this tester easier, faster, and safer to use and ending time-wasting "three-handed" testing; (2) protection through DUAL indication of voltage by solenoid and neon lamp working independently; (3) positive scale reading; (4) signal by hum and vibration; and (5) thorough insulation throughout, even to the sharp point of each prod.

Well built and shock-proof in a LAMINATED bakelite housing, the Knopp Voltage Tester tells immediately and simply if circuit is open or closed; magnitude of voltage between 110 and 600; a-c or d-c, pure or rectified; 25 or 60 cycles —for testing old and new circuits, fuses, locating grounds, etc.

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Ohio, has proved out. E. Herzog, electrical engineer at the Base, reported that three years of operating experience has been excellent. Multiple faults have not occurred; predicted operating troubles have not materialized; operation is simple and essentially foolproof; a resistance grounded alternate has not been used; operating and engineering personnel, originally opposed to the system, are now well pleased. Installation cost compares favorably with solid grounding and gives better continuity of operation, Herzog added.

A preventive maintenance program needs more than just an organized system of periodic checking according to L. J. Mamer, chief engineer, The Evanston Hospital Association, Evanston, Illinois. He suggested such a system be backed up with adequate tools, instruments, repair parts and supplies; instruction sheets and descriptive literature on each piece of equipment in the plant; and a system of good housekeeping to go hand-in-hand with maintenance.

With 80 percent of the nation's farms reached by electricity (10 percent in 1928), a rapid growth in power requirements of farm customers is anticipated by J. H. Oliver, in charge of product development, farm industry division, General Electric Company. To emphasize the labor economies afforded by electric power, he described in detail the electrification of a dairy farm and poultry farm. Keen competition in the latter industry is encouraging accelerated electrification, he revealed.

E. B. Ingraham Receives McGraw Award

Edgar B. Ingraham, president of the National Electrical Wholesalers Association, has been awarded the James H. McGraw Award Wholesalers Medal for 1948. Presentation was made by W. T. Stuart, editor of *Electrical Construction and Maintenance* and secretary of the Committee of Awards, at the morning meeting of the annual convention of the National Electrical Wholesalers Association on May 4, in Cincinnati.

The citation accompanying the award to Mr. Ingraham read as follows:

"Leadership demands of those who carry its responsibilities, a capacity for seeing beyond immediate industry objectives, for appraising them, not only in terms of present goals, but in terms of their influence on the larger objectives and progress of the industry through the course of time. And the quality of perspective is often a critical measure of

E. B. INGRAHAM

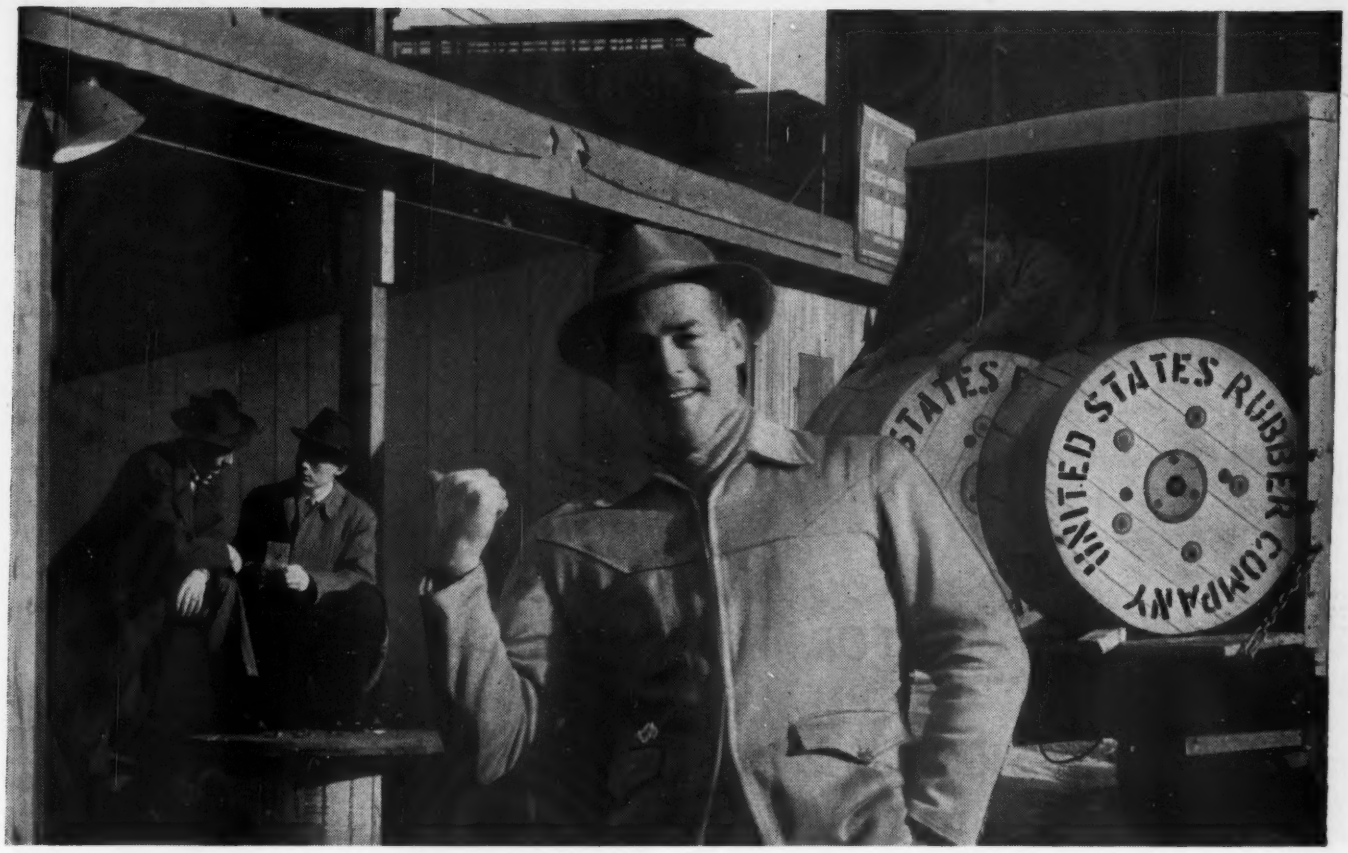
the quality of leadership. With exceptional foresight and inspiring leadership, Edgar B. Ingraham president of the Times Appliance Co., Inc. and president of the National Electrical Wholesalers Association, organized the Appliance Division of the National Electrical Wholesalers Association, making this important group an integral part of the Association. Upon the inception of the new division he carried out its difficult and exacting administrative work as its first chairman.

"Admittance of the newly organized division required major changes in the policies and programs of the Association. The sound judgment and confidence he exemplified brought about a strong spirit of cooperation throughout the membership. The Appliance Division was launched upon an ambitious and successful campaign designed to promote more efficiency and economy in appliance distribution, a project which has contributed materially to the benefit of all appliance distributors, manufacturers, dealers, utilities, contractors and the consuming public. Through many months of study and effort necessary to accomplish the change, Mr. Ingraham proved himself an able and stalwart worker as well as an understanding and considerate leader.

"His energetic leadership of the Appliance Division led to his election to the presidency of the Association in 1947, and his re-election in 1948.

"During Mr. Ingraham's presidency he even further expanded his activities and personal contributions to advance the economic position of electrical wholesaling by initiating constructive industry programs to be carried out by Committees of both Divisions of the Association. The effects of these efforts were industry-wide.

"Among them were programs for the better selection and upgrading of personnel, more practical training in basic selling principles; more efficient warehousing and stock control methods, better warehouse design, incentive approach to greater sales volume by means of Sales Boosters for wholesalers' salesmen, a greater understanding of service responsibilities of television distributors by publi-



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For the U. S. Rubber salesman teams up with the U. S. Distributor's salesman—to make sure you get the *right* kind of product . . . at the *right* time.

Your crews won't stand idle awaiting electrical wire shipments, when this team is working for you. They'll get you the stuff on time, because they have it stocked close to you.

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But the most important money-saving function of this "U. S." team is the quality of the product they bring to you. They provide such items as U. S. Laytex, the small diameter wire that enables you to take out 6 wires and put in 11 in the same conduit on rewiring jobs. This extra quality wire costs no more than ordinary code wire. Then there's Laytex RUW, the wire with unsurpassed insulation resistance in wet locations . . . U. S. Service Entrance Cables, the first ever approved by Underwriters' Laboratories with Neoprene cover and Laytex insulation.

Get together with the U. S. Rubber Salesman and the U. S. Rubber Distributor. You'll save money, every time.

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The electrical wholesaler performs an indispensable function in distributing electrical products. He keeps inventories, provides billing, credit and other services—each of which reduces the cost of the electrical product to the contractor.

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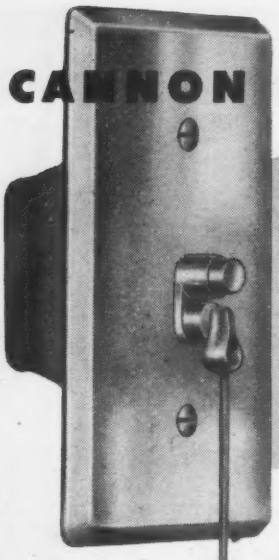
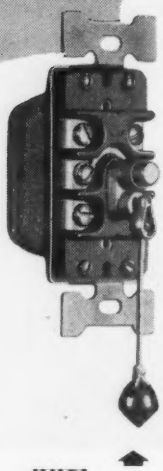


HMP1

Private Room Station with safety snap-on cord, Plaskon plate.



HMP1

Interior mechanism. All units are front connected on six-point, heavily barriered, molded bakelite, screw-type terminals.

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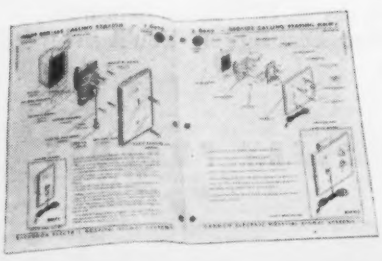

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The bulletin illustrated at left is unique among bulletins in this field in that exploded views of basic types of signal equipment with part numbers and identification are given. You can see what you are getting in each assembly. Bulletin will be sent in addition to the H-2 Signal System Bulletin, if requested. Address Department F-231.

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cation of a special technical manual and recommendation for more simplified reporting of monthly sales statistics to manufacturers.

"His unfailing graciousness, intelligent leadership, and long industry experience have, on many occasions, made possible the achievement of what often appears to be unattainable objectives for the industry's welfare."

The panel of judges who recommended Mr. Ingraham for this honor consisted of Herbert Metz, Graybar Electric Company, Inc., New York; F. R. Eiseman, Revere Electric Supply Company, Chicago; John M. Newton, Oakes Electrical Supply Company, Holyoke, Massachusetts; D. M. Salsbury, Westinghouse Electric Supply Company, New York; and W. T. Stuart, secretary, Committee of Awards, New York.

Baltimore Group Considers A/W Program

For its monthly meeting in April, the Electrical Contractors Association of Maryland sponsored an industry-wide get-to-gether for the electrical industry in Baltimore. The purpose of this meeting was to learn the details of the Program of the National Adequate Wiring Bureau and in turn to give consideration to the adoption of this program in Baltimore.

The principal speaker for this meeting was N. J. MacDonald, vice president of the Thomas & Betts Company and chairman of NAWB Executive Committee. He spoke on "Your Interest in Adequate Wiring". Pointing out that Baltimore is a "city of strong contrasts" he said that Baltimore prospered in the early days in an almost direct ratio to the expansion of the Baltimore and Ohio Railroad, as it opened up its line in 1827 to Ellicott Mills, (now Ellicott City, Md.) then to Cumberland, Maryland, and finally to Chicago. Using a miniature B & O Ry. boxcar as a symbol, loaded with a variety of cardboard cutout electrical appliances of the various types, such as ranges, refrigerators, hot water heaters, washing machines, disposall units, deep freezers, etc., he unloaded these items from the box car and placed them on miniature electric power lines. He then outlined the possible market for these power-consuming products in Baltimore's 245,000 homes, provided these homes are "adequately wired." He stated, however, that Baltimore's electrical industry can cash in on this market only to the extent that it can open up its (power) lines through adequate wiring.

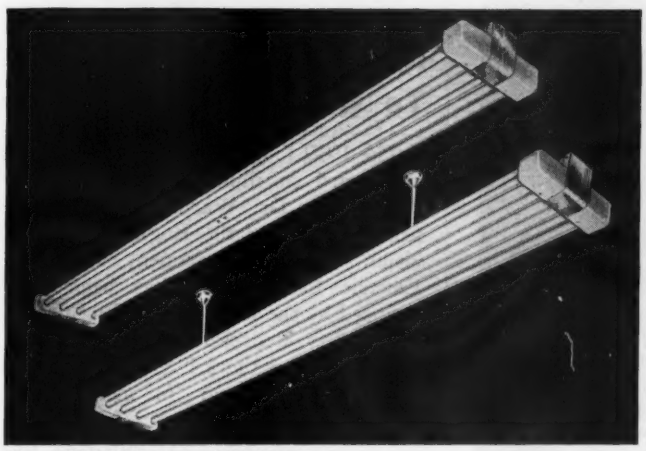
Miss Frances Armin, director of

Wm. PENN FLUORESCENT LIGHT MFRS.

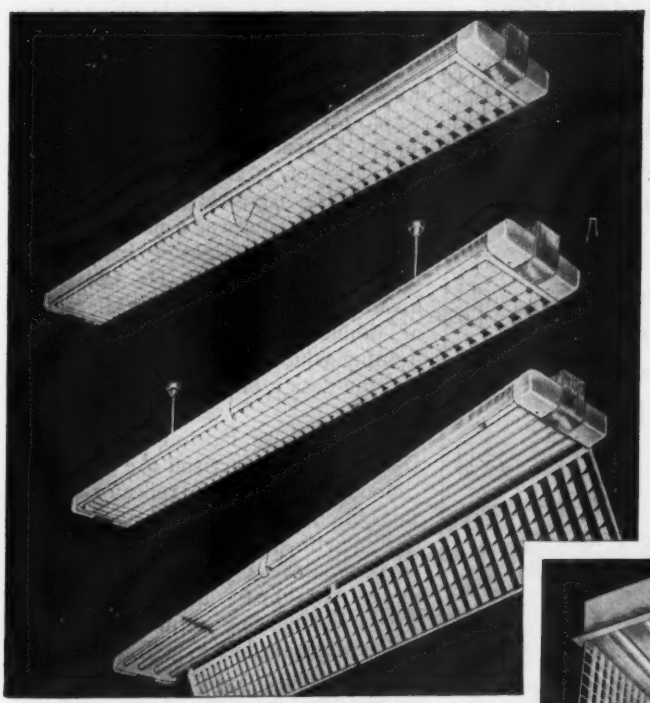
1639 SOUTH BROAD STREET • PHILADELPHIA 48 • PA.

Newest additions to attractive line of
commercial & industrial fluorescents

SLIMLINE fixtures that will delight your customers on looks, performance and price. Instant light without starters. Flush and pendant mounting, for single or continuous row. 2 and 4 tubes. Length 96". 100, 200, 300 MA. Simplicity of construction makes installation and service easy. Straight metal perforated sides and stamped metal ends, white enameled, with bright-metal trim.



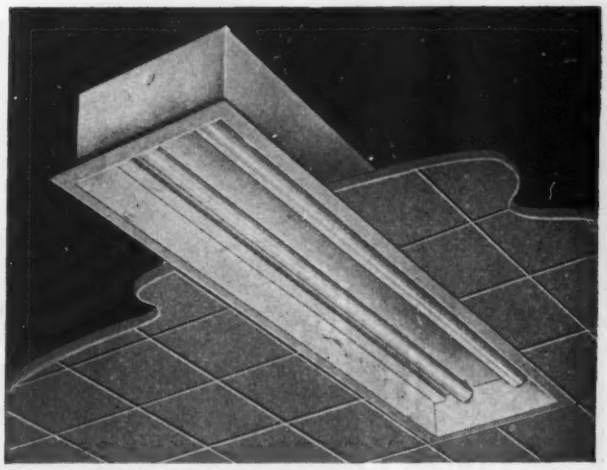
Wm. PENN Slimline #97 Open



Wm. PENN Slimline #97 with Hinged Louvre

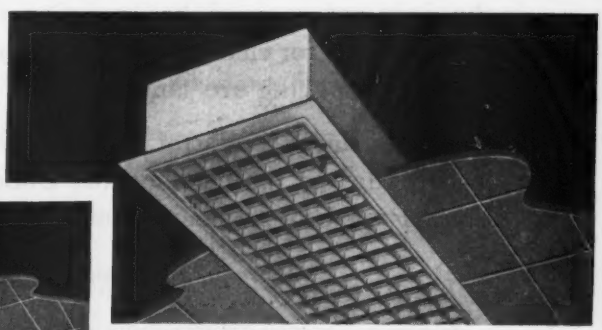
Sold through Wholesalers

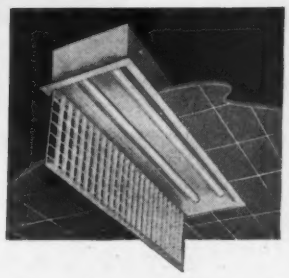
RECESS units that are most adaptable, efficient and economical. Beautifully designed for 2, 3 and 4 tubes (40-watt), single or continuous mounting. These are your fixtures for recessed lighting.



Wm. PENN #2-48 R. O. T. (Also 3 & 4 tubes)
Open-type troffer for direct, high-intensity lighting.

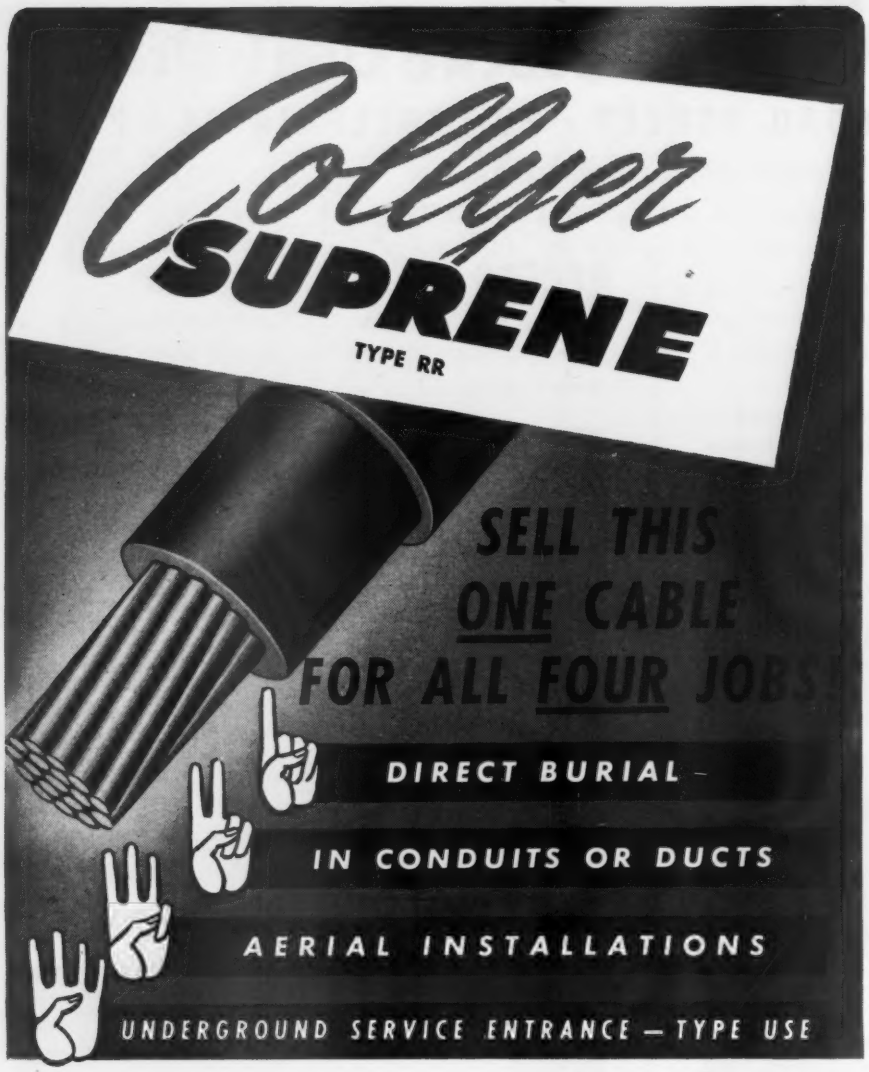
Wm. PENN #2-48 R. G. (2 tubes only)
Good looking unit with hinged shield of Pentacor glass. Efficient delivery of diffused light.





Wm. PENN #2-48 R. L. (Also 3 & 4 tubes)
For shadowless light in schools, offices, drafting rooms, etc., this unit has an attractive louvre that drops down for convenient cleaning and servicing.

Write for Catalog of complete Wm. PENN line



Electrical Contractors like Collyer SUPRENE because it's smooth, flexible neoprene sheath makes cable installation a fast, light job. At the same time it provides excellent protection against chemicals, oils, moisture, sunlight, and abrasion.

Collyer SUPRENE, made with moisture-resistant rubber insulation and neoprene jacket, gives long service in the air or underground; has exceptionally good electrical properties for efficient power delivery. Stripping, tapping and splicing are simplified, too.

Available in single conductor from 14 AWG to 1,000,000 CM; also in multi-conductor. Underwriters approved as type USE for Underground Service Entrance.

Write for information.

Collyer INSULATED WIRE CO.
245 ROOSEVELT AVENUE
PAWTUCKET, R. I.

Consumer and Market Research for the NAWB, spoke on the National Adequate Wiring Bureau as an organization. She concluded her talk with a showing of the new movie-slide film titled "The House that Jack Built," which is available to local electrical groups for showing to consumer groups.

After discussion of the Adequate Wiring program, it was voted that a ten-man committee be formed to study the problems involved in organizing a local Adequate Wiring Program and to report on its findings, with recommendations, at a future meeting. Charles H. Stark of Stark Electric Company, Baltimore, was appointed chairman of this committee.

IES Medal Awarded To Ward Harrison

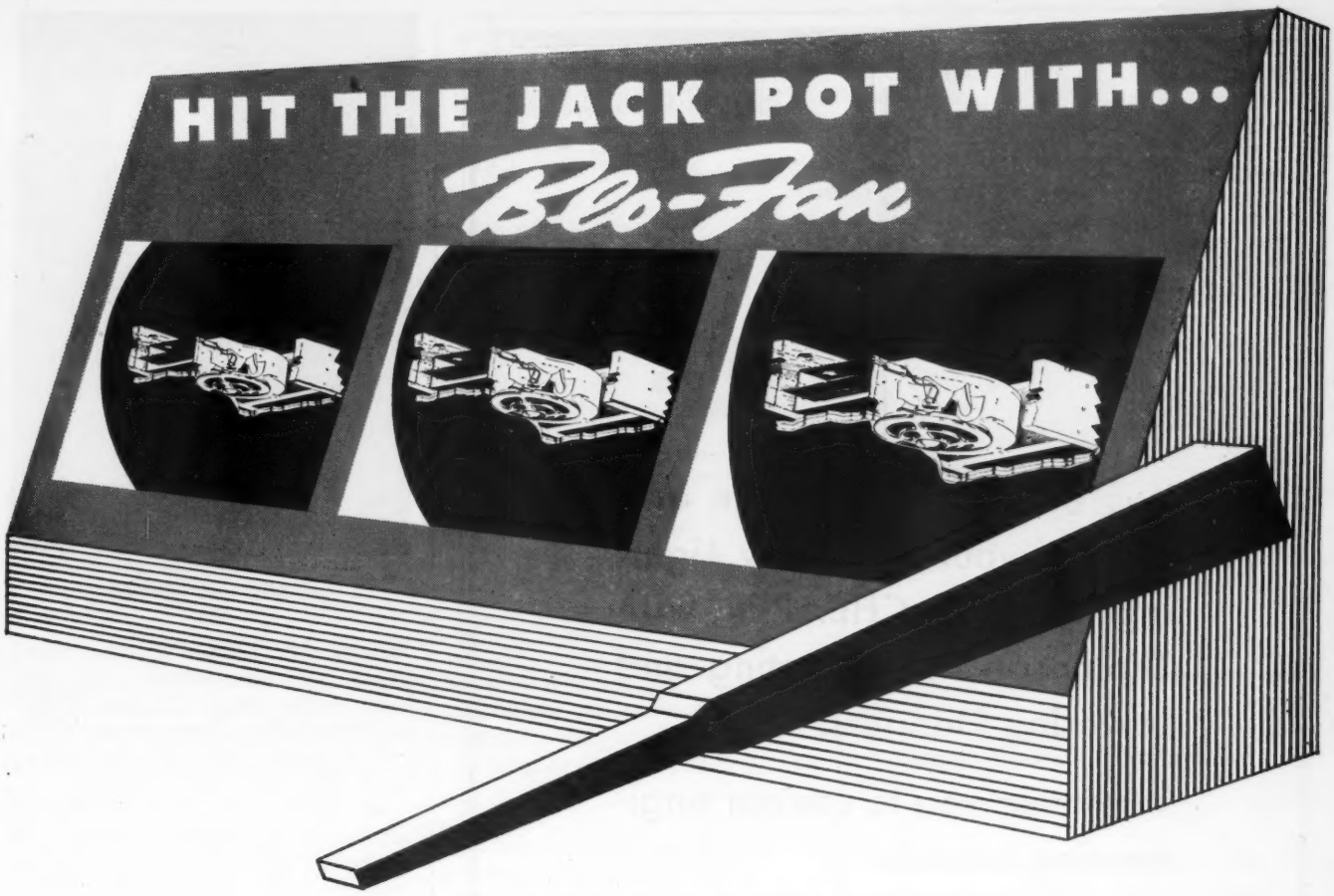
The 1949 I. E. S. Gold Medal, highest award in illumination, has been awarded to Dr. Ward Harrison, retired Director of the Engineering Division, Lamp Department, General Electric Company, it has been announced by the Illuminating Engineering Society. Representing the Society's top distinction the I.E.S. Gold Medal is awarded each year "for meritorious achievement conspicuously furthering the profession, art, and knowledge of illuminating engineering." Official presentation of the Medal, with an appropriate citation, will take place at the I. E. S. National Technical Conference to be held at French Lick, Indiana, during the week of September 19.

Dr. Harrison is eminently eligible for the award. For almost 20 years he was Director in charge of the largest illuminating engineering organization in the world, and was a pioneer in the formation of the Lighting Institute at Nela Park, Cleveland. He has made invaluable contributions to all phases of illumination development, from lighting education through technology and the design of basic lighting equipment.

Among those lighting fixtures designed by Dr. Harrison are the RLM Standard industrial reflector, used throughout the world and now a basic design with many manufacturers; the glassteel diffuser; the first clear-top enclosed semi-direct luminaire; and the first street lighting fixture with a prismatic dome reflector. His experience and knowledge have contributed greatly to new developments and improvements in the lighting equipment of many leading manufacturers.

Well known as an educator in the lighting field, Dr. Harison has for a number of years been a special lecturer in illuminating engineering at the Case

HIT THE JACK POT WITH... Blo-Fan



THE ONLY CEILING VENTILATOR WITH 9 SPEEDS FORWARD

This exclusive feature will help you sell more Model 210 Blo-Fan electric ceiling ventilators. The nine position control switch allows the housewife to operate her Blo-Fan at the speed required by the degree of air pollution. Women expect good home ventilation, so hit the jack pot by telling them about the new Blo-Fan nine-speed control.

STOCKED IN 300 CITIES BY 500 FRANCHISED WHOLESALERS

Blo-Fan

INSTALLS IN THE CEILING WHERE A FAN BELONGS

SPOT VENTILATION AT THE POINT OF AIR POLLUTION IN THE KITCHEN, BATHROOM, DEN, OR LAUNDRY

FOR THE ANSWER TO THE JACK POT QUESTION SEND THIS COUPON

PRYNE & CO., INC., Box E, Pomona, California
Please send me detailed information on the Blo-Fan 9 speed control switch and names of local distributors.

Name_____

Address_____

City_____

State_____

PRYNE & CO., INC. POMONA, CALIFORNIA • LOS ANGELES SAN FRANCISCO • CHICAGO • NEW YORK

You can clean, maintain and relamp your High Bay Lighting Fixtures CHEAPER with Thompson Disconnecting and Lowering Hangers.

We invite you to use our engineering service.

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THOMPSON
DISCONNECTING & LOWERING
HANGERS

THE THOMPSON ELECTRIC CO.
1101 POWER AVENUE • CLEVELAND 14, OHIO

WARD HARRISON

Institute of Technology, Cleveland, Ohio, and is the author of two text books on the subject. His contributions to *Illuminating Engineering,* official I. E. S. journal, and other publications in the field have been numerous.

Dr. Harrison is a Fellow of the Illuminating Engineering Society, and has been active in Society activities for many years. In addition to his term as President (1922-23), he has served as chairman of numerous committees and as a board member of the Pittsburgh and Cleveland Sections of I. E. S. His achievements in the field of illuminating engineering have earned him many honors in addition to the I. E. S. award.

In 1940 Dr. Harrison received the honorary degree of Doctor of Illuminating Engineering from the Case School of Applied Science, the first such degree granted in America. An example of his world-wide prestige was the invitation to deliver the principal adress at the 1948 Convention of the British I.E.S.

Fluorescent Lighting Assn. Holds Meeting

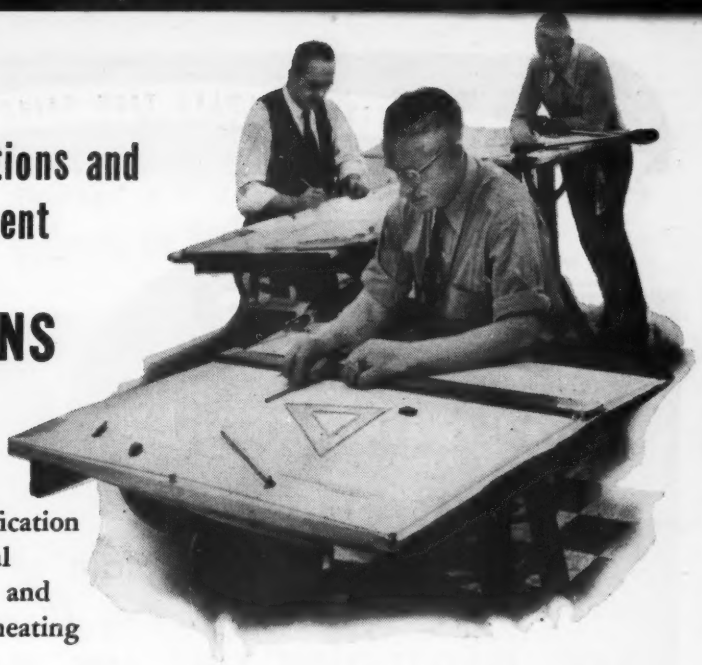
The annual meeting of the Fluorescent Lighting Association, was held on April 21 at the Hotel Commodore, New York City.

The session was devoted to discussions of the latest practices and developments in cold cathode standardized lighting. L. C. Marschall, Sola Electric Co., Chicago, gave a talk on auxiliary equipment, and B. F. Green spoke on the subject of present cold cathode lamp standards.

The meeting was preceded by the election of the Board of Directors. Officers elected for the coming year are:

—for men who plan electrical installations and specify electrical materials and equipment

ELECTRICAL SPECIFICATIONS
July Issue



A 60-page reference book of up-to-the-minute specification paragraphs covering every phase of interior electrical work—lighting, wiring, power applications, motors and controls, signalling and communication, and electric heating

WITH BIDDING becoming more and more competitive, there is a need for writing good, tight specifications that show the adequacy and quality of the electrical job and can be used by electrical men to demonstrate and sell the customer on what he is getting for his money.

Here is a timely publishing service that establishes standard specifications, which, if used on every job, can create a higher level on which all job bidding can be based. It provides electrical contractors, architects, consulting engineers and chief electricians alike with a standard authoritative reference for planning all future electrical installations.

Here's Why This Issue Will Be Valuable To You!

1. Each section will be written as specification paragraphs enabling you to prepare your own specifications by copying directly from this master reference.
2. It will enable you to check on the completeness of specifications prepared by others so that you can present recommendations for changes or additions in order to sell superior methods and materials.
3. To help you in your selection of products when writing electrical specifications, all products advertised will be listed under name of supplier and under general product headings in a Special Manufacturers' Product Index.
4. This feature together with the July 1948 Electrical Construction Methods Issue will serve as a guide for two very important steps in electrical construction.

Master Electrical Specification
July 1949

To aid you in planning all your future installations, each specification paragraph will be coded for easy reference, under the following general headings:

1.1	General Conditions
1.3	Procedure
2.1	Service Entrances
2.2	Grounding
3.1	Transformers
4.1	Switches and Panels
5.1	Feeders
6.1	Branch Circuits
7.1	Signal, Communication and Auxiliary Systems
8.1	Lighting
9.1	Motors and Motor Control
10.1	Data Tables

Do you have an architect or consulting engineer to whom you would like a copy of this special issue sent? If so, send us his name and address, and we'll see that he receives a copy without any obligation to you.

A McGraw-Hill Publication
330 W. 42nd Street, New York 18, N. Y.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

THE BEST CRAFTSMEN ALWAYS TAKE PAINE'S...

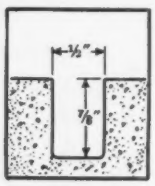
PAINE
EXPANSION SCREW
ANCHORS

PAINE
"900"

SAVE INSTALLATION TIME AND MONEY...
hold up to 10,000 lbs. in any Solid Material

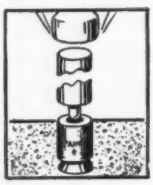
When you find it necessary to fasten objects such as machinery, shelving and electrical equipment to solid floors, walls and ceiling, you can save yourself time and trouble by using Paine Expansion Screw Anchors No. 900 (screws are not included). These anchors are quickly set in place to make a permanent anchorage that is capable of supporting up to 10,000 lbs., depending on the size used. They can be used in stone, marble, concrete or any other solid material. They are rust proofed and vibration resistant. A Setting Tool comes in every box. The anchors are stamped with size and thread of bolt or screw to use and have a directional arrow identifying which end goes in the hole.

Use a Paine Sudden Depth Rotary Drill bit for quick, accurate holes or, for the occasional user, use a Paine Hand Hammer Star Drill.

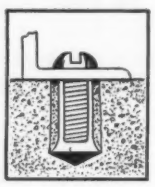


*For the Paine ¼-20 drill a ½" hole, at least ⅞" deep.

Place the anchor in the hole with the arrow on the anchor pointing down.



Place set tool on anchor and pound until anchor is set.



Screw the object to be anchored as tightly as possible.

*Dimensions in first illustration apply to Paine ¼-20 only.

THE PAINE COMPANY

2961 Carroll Avenue Chicago 12, Illinois

OTHER PRODUCTS

PAINE ANCHORS RANGERS Superior Features BUILDERS SPECIALTIES

Spring Wing Toggle Bolts
Expansion Anchors
"Sudden Depth" Drills
Wood Screw Anchors
Pipe and Conduit Clamps and Straps
Hanger Iron, perforated
Expansion Shells
Star Drills
Malleable Shields
Special Hanging and Fastening Devices

WRITE FOR CATALOG

President, Robert Cutler, president of the Cutler Light Manufacturing Co., Philadelphia; First Vice President: Edward Miller, Acme Electric Co., Cuba, N. Y.; Second Vice President: Abner Byer, Cold Cathode Lighting Corp., N. Y.; Secretary: Victor Todd, Swedish Iron and Steel Corp., N. Y; and Treasurer: Miles Pennybacker, Voltarc Tubes Inc., Norwalk Conn.

S. D. Contractors Promote Farm Wiring

Electrical contractors on the FEM Rural Electric Cooperative at Ipswich, South Dakota, have organized to promote high standards of farm wiring in the three-county area covered by the co-op. To date FEM has total allotments for 1,027 miles of line to serve 1,196 customers and is considering an additional allotment for 1,000 more miles of line.

In each of the three counties, the new association will underwrite part of a model farm wiring installation cost. The three farms will feature adequate wiring of the farm home as well as outbuildings and show the advantages of full utilization of electricity to farm home and production activities. Wiring installations are to be planned to conform to the standards prescribed in the Minnesota Farmstead Wiring Handbook.

Officials of the group are: President —R. W. Meyer, Ipswich; vice-president—Carl Bareither, Eureka; secretary-treasurer—Jacob S. Becker, Leola, South Dakota.

Dates Ahead

National Industrial Service Association—Annual convention, Hotel Jefferson, St. Louis, Mo., June 9-11.
Store Modernization Show—Grand Central Palace, New York, June 19-24.
New York State Association of Electrical Contractors and Dealers, Inc.—Saranac Inn, N. Y., July 2-9.
International Association of Electrical Inspectors—Eastern Section, Hotel Statler, Boston, Mass., August 11-13; Western Section, Hotel Statler, St. Louis, Mo., September 26-28; Northwestern Section, Butte, Mont., October 3-5; Southwestern Section, Hotel San Diego, San Diego, Calif., October 10-12; Southern Section, Hotel Shamrock, Houston, Texas, October 17-19.
Illuminating Engineering Society—National Technical Conference, French Lick, Ind. ,September 19-23.
Pennsylvania Electric Association—Annual meeting, Benjamin Franklin Hotel, Philadelphia, Pa., September 20-21.
National Electronics Conference—Edgewater Beach Hotel, Chicago, Ill., September 26-27.
International Municipal Signal Association—Annual meeting, Wm. Penn Hotel, Pittsburgh, Pa., October 10-13.
National Safety Congress and Exposition—Chicago, Ill., October 24-28.
National Electrical Contractors Association—Annual convention, Rice Hotel, Houston, Texas, November 8-11.
National Electrical Manufacturers Association—Chalfonte-Hallon Hall, Atlantic City, N. J., November 13-18.
Sixth All-Industry Refrigeration & Air Conditioning Exposition—Atlantic City, N. J., November 14-18.

Plant Maintenance Show and Conference—Auditorium, Cleveland, Ohio, January 16-19.
American Society of Heating and Ventilating Engineers—Dallas, Texas, January 23-27.
Southwest Air Conditioning Exposition—Dallas, Texas, January 23-27.
American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., January 30-February 3.
National Electrical Manufacturers Association—Edgewater Beach Hotel, Chicago, Ill., March 13-16.

Manufacturers News

General Electric Changes

Re-election of Charles E. Wilson and Philip D. Reed as president and chairman of the board respectively of the General Electric Company, and the election of Ralph J. Cordiner as executive vice president and a director of the company has been announced. Other company officers were reelected.

Mr. Cordiner has been vice president and assistant to the president since February, 1945. He became assistant to the president in July, 1943, after

R. J. CORDINER

serving during the war as director general of war production scheduling and War Production Board vice chairman.

John O. Wetherbie, former New York district manager for the General Electric Construction Materials Department, has been appointed a G-E special representative with headquarters at 570 Lexington Avenue, New York City. He will report to C. C. Walker, vice president and general manager of the Construction Materials Department and T. F. Barton, commercial vice president.

Other appointments in the Construction Materials Department are—O. A. Kirkland, formerly New York assistant district manager, has been named manager of the New York District. Alexander P. Leverty has been assigned to the Atlantic District as a district representative. He will be located in Richmond, Va. William R. Wright and Elmer K. Stieglitz have been appointed district representatives. Mr. Wright has been assigned to the Atlantic District and will cover the

It's easy to help your community plan a job like this

Riverview Field, Poughkeepsie, N. Y.—Financed by a City bond issue

The floodlighting of Riverview Field, currently the best lighted field in the Colonial Baseball League, was planned, ordered and installed according to "G-E standard plans." Any competent contractor after reviewing the floodlighting plans in the manual can confidently help his community plan a floodlighted field.

These plans, representing years of floodlight engineering experience, specify everything to assure a perfect lighting job—from the exact location of the steel poles to the last wiring detail.

As in every standardized layout, floodlights were aimed while on the ground, according to predetermined charts. This is typical of the service offered by G-E Lighting Specialists to save you time and money.

Here is the type of job any competent contractor can handle even though he has no previous floodlighting experience. It should yield a satisfactory profit—and it frequently carries with the initial installation, a year after year maintenance contract.

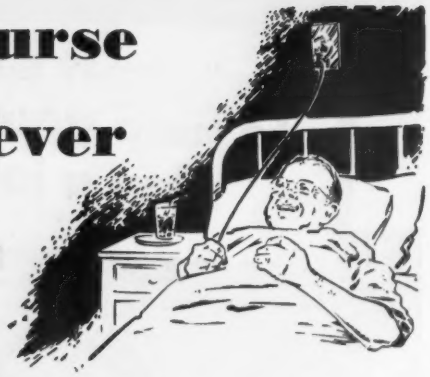
THE SPORTSLIGHT—This is the floodlight used at Riverview Field, the G-E Type L-69. It gives more light per unit, more light per watt, is easier to install and cheaper to maintain than any other comparable unit. It's so good that four major-league parks use it, so economical that it's the favorite for sand-lot softball. Bulletin GEA-4835 gives complete description and prices.

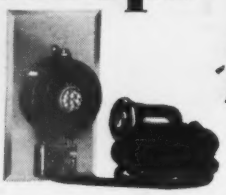
YOURS FOR THE ASKING—This is the manual that contains 38 complete floodlighting plans for sports and recreation. One is the "240" lighting system used at Riverview Field—240 G-E floodlights on 10 100-foot steel poles—complete with a list of all material required down to concrete and paint. Among other plans are tennis courts, volleyball, softball fields. Ask for it as GET-1284. Address *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

451-132

The Nurse that never Sleeps





Day or night, there's no let-up in the "special nurse" care of a Couch Signaling System. There's constant security for *every patient* . . . greater freedom for regular nurses, added efficiency.

The magnetic type call station pictured was formerly made by Chicago Signal Co. It is preferred equipment in many hospitals because of the slight pressure required to operate it. The standard locking button and pull cord stations are also regular items in the Couch Line of hospital equipment.

The Nurse's Call is only part of the versatile Couch electric "nerve system" for hospitals. For full information on Doctors' Paging . . . Doctors' In and Out . . . Fire Alarm . . . Private Telephone . . . Return Call Systems, send for Bulletin H-1.

S. H. COUCH COMPANY, INC.

DEPT. NO. 806C NORTH QUINCY 71, MASS.

PRIVATE TELEPHONES for HOME and OFFICE . . . HOSPITAL SIGNALING SYSTEMS . . . APARTMENT HOUSE TELEPHONES and MAILBOXES . . . FIRE ALARM SYSTEMS for INDUSTRIAL PLANTS and PUBLIC BUILDINGS.

STONCO

EASIER INSTALLATION

LARGER FLOOD AREA

Better mounting because of improved thread fit. Lighter weight. Trough design gives greater room for wiring. Wider light spread area. Stonco equipment has complete adjustability—vertical and horizontal. Easier to set for aim. Can be completely assembled on the ground and wired on the pole.

A Contractor's Dream

SOLD EXCLUSIVELY THROUGH QUALIFIED WHOLESALERS

STONCO

STONE MANUFACTURING COMPANY

489 Henry Street Elizabeth 4, N. J.

wholesale and trading area of Lancaster, Pa. Mr. Stieglitz has been assigned to the Southeastern district and will cover Knoxville, Tenn.

Joseph H. Shull, has been appointed supervisor of commercial scheduling and order service for the wiring device division of Construction Materials Department.

The appointment of Steven C. Van Voorhis as manager of advertising and sales promotion for the newly-formed Michigan District of G-E's Apparatus Department has been announced.

Five appointments to top positions in the sales organization of General Electric's Lamp Department at Nela Park have been announced.

O. H. Young, who has been assistant to P. D. Parker, general sales manager, was advanced to the position of assistant manager of the General Sales division. In addition, managers for the sales division's four major functional operations were named as follows: Utility and fixture promotion, E. D. Stryker; quantity consumer sales, R. E. Worstell; retail sales, T. C. Ohart; and original installation sales, W. E. Davidson.

Establishment of a new sales district and the appointment of two district sales manager have been announced by the Lamp Department. The new district, to be known as the South Central sales district, will have its headquarters in Memphis, Tenn.

Named to head the new sales district is George V. Ellis, who now is a member of the sales organization of the Southeastern sales district, with headquarters at Atlanta, Ga. Mr. Ellis is stationed at Birmingham, Ala.

Also appointed to a sales district managership is Robert V. Corning, who will head the Ohio Valley sales district, with offices in Cincinnati, Ohio. He is being transferred from the Lamp Department's general sales division at Nela Park.

Another new district, to be known as the Motor City sales district, will have its headquarters in Detroit, Mich. It will be headed by John W. Fleischer, now assistant manager of the Michigan sales district.

The Lamp Department has opened a new plant at Logan, Ohio, for the production of glass tubing used in the manufacture of incandescent lamps. It is expected that eventually the factory will produce tubes for regular and slimline fluorescent lamps. Manager of the new glass works is B. G. Greenman, Jr.

J. R. Ford Named G.S.M. of Jefferson

John R. Ford has been appointed general sales manager of the Jefferson Electric Company, Bellwood, Ill.

Mr. Ford has been associated with Jefferson for the past 19 years in various capacities. He was Milwaukee representative from 1930 to 1932, at which time he was transferred to

Minneapolis. From 1935 to 1944 he covered the Northwest area. He returned to the factory in 1944 in charge of material procurement for war contracts. Since the end of the war, Mr. Ford has been sales representative in the Chicago territory.

Roebling Appointments

John A. Roebling's Sons Company, Trenton, N. J. has announced the appointment of Herbert D. Rathbun as secretary and treasurer. He succeeds Archibald W. Brown, who recently retired after 47 years service. Mr. Brown continues as a member of the board of directors.

Clarence W. Snyder has been named comptroller and assistant secretary and H. Russell Brown as assistant treasurer and assistant secretary.

Westinghouse Directors Re-elected

Six directors of the Westinghouse Electric Corporation were re-elected recently by stockholders of the company at their annual meeting in Pittsburgh.

Named directors for four-year terms were: G. H. Bucher, vice chairman, Westinghouse Electric Corporation, Pittsburgh; A. W. Page, Industrial Consultant, New York City; W. C. Robinson, president, National Electric Products Corporation, Pittsburgh; and R. T. Swaine, partner in the law firm of Cravath, Swaine & Moore, New York City. Roscoe Seybold, Westinghouse vice president was elected a director for a term of three years, and Edward Hopkinson, Jr., partner in Drexel & Company, Philadelphia, was named a director for one year.

•

Ward Leonard Electric Co., Mount Vernon, N. Y. has moved its general office from the factory building at 31 South Street to a new office building at 115 South MacQuesten Parkway, Mount Vernon.

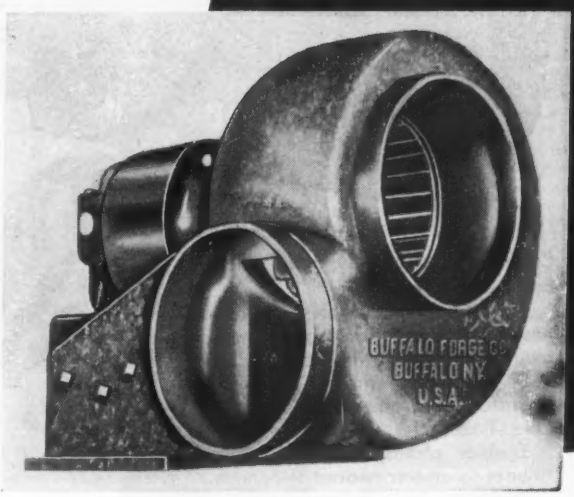
•

Motorola, Inc. has expanded its communications division and opened a second region in the New York-New England area. P. R. Kendall will be regional manager for Maine, Massachusetts, New Hampshire, Vermont and New York City, excepting the metropolitan New York area. Five assistant engineers are to be under his supervision.

Lowell E. White has been appointed manager of the region consisting of Rhode Island, Connecticut, New Jersey and the metropolitan New York City area, and will direct four assistant engineers.

HERE'S THE RELIABLE FAN FOR YOUR "SMALL-SPACE" JOBS!

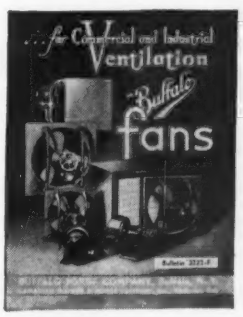
- COMPACT
- ADJUSTABLE
- STURDY
- EFFICIENT



"Buffalo" BABY VENT SET

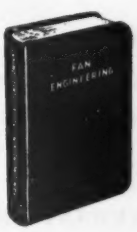
● Duct-connected or free air delivery—simple to install—easily movable—this compact little "Buffalo" fan is a "natural" for removing gas, moisture, steam, smoke, odors from small areas and hooded vats.

Discharge position is adjustable and rotation reversible to suit the installation. Housing is husky cast iron. Rotor is efficient, multiblade type. Here's long life and real flexibility plus the efficient service that SATISFIES CUSTOMERS. Write for Bulletin 3222-F, lower left, which describes "Buffalo" Baby Vent Sets and other service-proven "Buffalo" fans ready to solve your ventilation problems.



Facts To Make Your Job Easier!

FAN ENGINEERING, 5th Edition, pocket size, has 808 pages of practical answers to YOUR air problems. Easy to read. Section on disk fans and every other type of fan. For better results on YOUR jobs, send check or M. O. now! Only $6.00 postpaid in U. S. A.



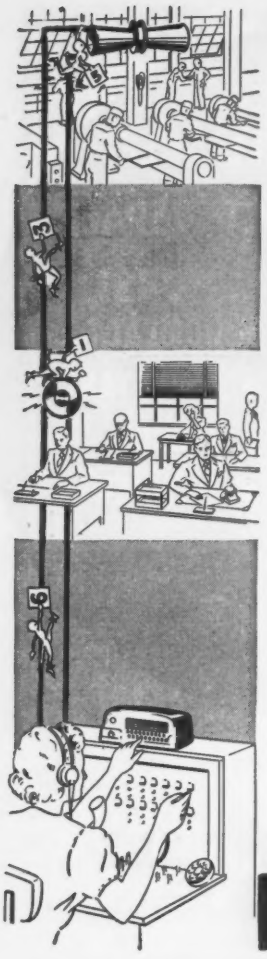
"Buffalo" First For Fans

BUFFALO FORGE COMPANY

520 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in All Principal Cities

PANEL BREEZO FANS BELTED VENT SETS BELT-AIR FANS
BREEZ-AIR ATTIC FANS "L" BREEZO FANS "NV" BREEZO FANS



NEW Wheelock CODE CALL FOR INSTANT COMMUNICATION

Code call is made by a numerical code, sounding signals.

Promptly completes telephone connections with organization personnel away from their own telephones.

Eliminates time waste of telephone operator and other employees in "man-finding."

Enables employees without telephones to answer nearest telephone.

Write for New Bulletin B4-3.

SIGNAL ENGINEERING and MANUFACTURING COMPANY

154 WEST 14th ST. · NEW YORK 11, N. Y.

THE MAGNO-TRONIC FLUORESCENT STARTER

PROTECTS — Fully, automatic thermal relay with unusually long life that eliminates blinking lights and protects all auxiliary equipment.

SIMPLIFIES — Replacement of worn-out lamp automatically restores closed circuit—replacement of starter unnecessary. No button to push.

REDUCES COSTS — Magno-Tronic starters provide exact timing in the lamp electrode—preheating process preventing excessive loss of emission material, thereby assuring the maximum in the useful life of a lamp. The established quality of this starter saves considerable time in maintenance and man hours required to repair and/or replace an inoperative lighting unit.

VERSATILE — Will operate efficiently over an extended voltage range under widely varying temperatures.

GUARANTEED FOR ONE YEAR.

The (SP-15-20) for use with either 15 or 20 watt lamps
The (SP-30-40) for use with either 30 or 40 watt lamps
The (SP-100) for use with 100 watt lamps

Ask for descriptive literature

INDUSTRIAL ELECTRONICS CORP.

MAIN PLANT Newark 2, N. J.

Appointment of Equipment Engineering Company, Memphis, Tenn. as distributor for Skylift electric industrial trucks and transporter motorized hand trucks has been announced by the **Automatic Transportation Co.** They will serve Northern Mississippi, Western Tennessee and Eastern Arkansas. Offices are located in the Sterick Building.

•

Tomic Sales and Engineering Company of Detroit has announced the appointment of two new representatives. Robert H. Schaub, 2003 Ann St., Utica, N. Y. will cover the northern part of the State of New York and Kenneth B. Schumann, 814 Twelfth St., Denver, will cover the states of Colorado, Wyoming, Utah and New Mexico.

•

The Frink Corporation of Long Island City, N. Y. has named Lon E. Russell as sales representative for Georgia, Alabama and Florida. His headquarters are in the Chamber of Commerce Building, Miama, Fla.

•

The Art Metal Company, Cleveland, announces the appointment of Brooks Chassaing as general sales manager. For the time being Mr. Chassaing will continue to make the St. Louis office his headquarters.

•

The Black & Decker Mfg. Co., Towson, Md. announces that R. A. Lomas, service engineer at the Seattle branch, has been transferred in the same capacity to the Los Angeles branch. G. S. Ellis has been promoted to service engineer at Seattle.

•

Western Insulated Wire Company of Los Angeles, Calif., has named Curt H. Conrad as sales representative and manufacturer's agent to cover the states of Iowa, Nebraska, Missouri and Kansas.

•

The appointment of Ray H. Hiller as the Atlanta, Ga., representative of **Curtis Lighting, Inc.** has been announced.

•

Robert C. Wilson has been appointed manager of sales at the Norwood, Ohio works of the **Trumbull Electric Mfg. Company** of Plainville, Conn.

•

Easterline-Angus has appointed the Eicher & Company 263 Coleman Bldg., Seattle, Wash. as representatives in the Seattle territory.

Burndy Engineering Company, Inc., New York City, has appointed Ted Gravenson as sales promotion manager.

•

Carter B. Hart, formerly sales representative in the **Allis-Chalmers** Boston district office, has been named New England region dealer supervisor.

•

Everett Gilbert has been promoted to the position of vice president for engineering at **Radio Frequency Laboratories, Inc.,** Boonton, N. J.

•

Harold H. Maass has been promoted from production manager and plant superintendent of **Colonial Electric Products, Inc.,** East Paterson, N. J. to director of the New Business Development Division of the company.

•

Revere Copper and Brass Incorporated has opened a new Coast plant at 6500 E. Slauson Ave., Los Angeles, Calif. The plant comprises 13½ acres at the intersection of Garfield and Slauson Avenues.

•

The Adalet Manufacturing Company, Cleveland, Ohio, has announced the appointment of Vincent J. Brown Company, 564 Ellicott Square, Buffalo 3, N. Y. as factory representative.

•

H. B. Hall has been made manager of the Nashville, Tenn. branch of **Graybar Electric Company.** He succeeds the late S. L. Cook.

•

The Electric Products Company, 1725 Clarkstone Road, Cleveland, Ohio has announced the appointment of Henry J. Leisenheimer as manager of export sales.

•

Sterling Electric Motors, Inc. of Los Angeles, has opened offices and a warehouse in Portland, Ore. at 501 N. W. Park Ave.

•

Chester H. Sanderson has been appointed advertising manager of **Mine Safety Appliances Company,** Pittsburgh, Pa.

•

Columbia Wire & Supply Company has moved into a new and larger plant at 2850 Irving Park Road, Chicago, Ill.

FULLMAN Latrobe PRODUCTS

FLOOR BOXES — WIRING SPECIALTIES

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.

"LATROBE" PRODUCTS OFFER ECONOMY AND SERVICE

"Latrobe" Floor Boxes and Wiring Specialties are designed to insure quick installation and long, efficient service.

"Latrobe" Products are compact. Parts are kept to a minimum. Materials used are finest quality available.

No. 330 Tom Thumb Utility Outlet

Ideal for use in wood floors, mantels, baseboards, show windows and other installations free from moisture or mechanical injury. Easy to install without marring finish.

No. 252-R "Latrobe" Two Gang Box

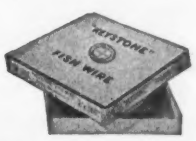
The No. 252-R Two Gang Box is adjustable and has our No. 208 Receptacle in one section. One cover plate has ½" Flush Brass Plug; other has 2" Flush Brass Plug.

No. 280 Nozzle with No. 200 Cover Plate

10 Amp. 250 volt Receptable in Brass Housing, mounted on ½" brass pipe extension 3" long. Longer extension if desired.

No. 110 "Latrobe" Watertight Box

The neat, compact design of the No. 110 Box quickens installation time and makes for smooth, trouble-free service. 208 Receptacle. Cover Plate is 3½" diam.



Keystone Fish Wire

Finest grade flat steel wire in ten sizes, ranging from lightest work up to heaviest power wiring. 100, 150 and 200 foot coils.

Sold Only Through Wholesalers

No. 150 Box — No. 207 Nozzle

This adjustable, watertight Floor Box has 4¼" Cover Plate and large Adjusting Ring No. 215. Compact, economical, efficient.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

THE ADALET MANUFACTURING CO.

Write for illustrated booklet on SALI Insulating Bushings

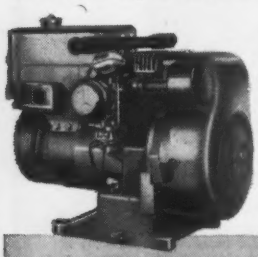
14300 LORAIN AVE.
CLEVELAND 11, OHIO

1 MAN CAN DO THE WORK OF A CREW...

with an

ONAN PORTABLE ELECTRIC PLANT

Use fast-working, cost-cutting electric tools on every job. Lightweight, Onan air-cooled, engine-driven electric plants supply instantly-available power *anywhere* for lights, drills, saws, pipe-threaders, planers, spades, and tampers. Carry 'em, wheel 'em, or truck 'em right to the spot and plug-in for all the power you need. Equipped with carrying handles or dolly-mounted.



A.C. Models: 350 to 35,000 watts.

D.C. Models: 1200 to 15,000 watts.

Diesel Plants: 2,500 to 55,000 watts.

Send for Catalog

ONAN ELECTRIC PLANTS

D. W. ONAN & SONS INC.
3166 Royalston Ave., Minneapolis 5, Minn.

Send your catalog on Portable Electric Plants

NAME_____

ADDRESS_____

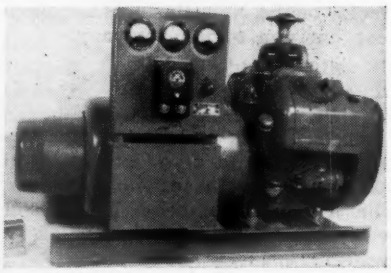
CITY_____ STATE_____

MORE EQUIPMENT NEWS

[FROM PAGE 108]

Infra-Red Unit

Insulated Spir-O-Therm (lampless) units are interchangeable with this standard line of insulated infra-red lamped units. They bake, dry, heat, preheat, carbonize and dehydrate. Construction is Pyrex tubes with spiral channel resistors, stainless steel contacts and stainless steel reflectors. The standard lampless Spir-O-Therms used in lampless insulated infra-red units is 375 watts. Other wattages are also available. For either 115 or 230 volts. Miskella Infra-Red Company, East 73d and Grand Avenue, Cleveland 4, Ohio.

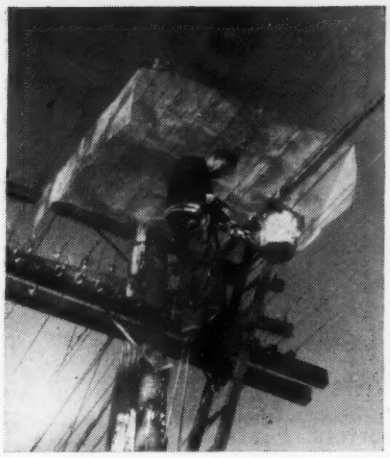


Power Plant

A line of power plants particularly suitable for standby power and emergency supply of electricity for power and light has been designed. They are powered with 1, 2 and 4 cylinder, air-cooled engines and can be installed in freezing atmospheres. Engines are equipped with high tension magnetos. All models available with electrical cranking on specification. Available with or without automatic voltage regulator. They are designed to run at 1800 rpm. Also for continuous operation. Generators are built in 1200, 900, and 720 rpm. in capacities ranging from 5000 watts to 200 kilowatts at 60 cycle. Also available in frequencies ranging from 25 cycles to 400 cycles. Kato Engineering Co., Mankato, Minn.

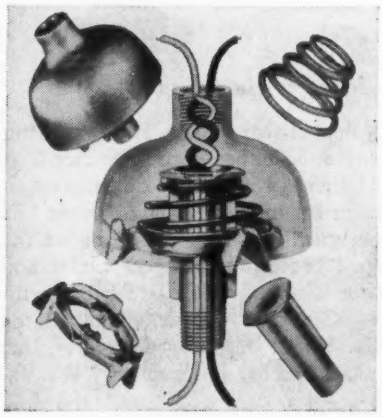
Fluorescent Fixture

Announcement has been made of the development of a new lighting series of slimline fixtures in two and four lamp 72 and 96 inch sizes, with either destatized plastic or luminous metal side panels. The 96 inch size is available for T8 and T12, 75 watt slimline lamps. Can be mounted individually or in continuous rows, flush or suspension and can be used with adjustable spot or floodlights for accent lighting. Keystone Electric Manufacturing Co., 2228 E. Tioga St., Philadelphia 34, Pa.



Tarp

The "Star-Tarp," a tarp designed especially for telephone and power company use, is fabricated of heavy gauge Vinylite plastic. Being transparent it permits the worker to take advantage of natural day-light, yet offers protection from wind, rain, snow or sleet. Insulating qualities are an advantage as it can be thrown over bare telephone wires without fear of creating noise or disturbance for customers being served by the wires. It can be folded up wet without fear of rotting. Available in various sizes. Plastic Sheeting Company, 1205 S. E. Grand Ave., Portland 14, Ore.



Shock Absorbers

A line of spring-loaded shock absorbers designed to provide shockproof mounting for industrial lighting fixtures, meters, fans, motors, unit heaters, instrument panels, process controls, has been announced. Unit has three malleable cast iron parts: bell-shaped body, open spring plate, and stem, and steel spring. All parts are cadmium plated for corrosion resistance, except for the Series 70 "heavy-duty" model which is hot-dip galvanized. They are available in five models, two "Junior" size and three "Heavy-duty." All units have a ½ inch male thread pipe bottom connection. Thompson Electric Co., 1101 Power Ave., Cleveland 14, Ohio.

Subject:
ANCHORING DOOR FRAMES

at 66% SAVING in TIME and LABOR!

with the

M·S·A

VELOCITY-POWER

Driver

One of many applications: metal door frames, anchored with 4 studs to concrete in less than 5 minutes per frame! That's a typical performance record with the amazing M.S.A. Velocity-Power DRIVER—the *safety-engineered* powder-actuated tool that is revolutionizing stud-driving jobs throughout industry. Just load, position, and fire—stud is in place as easy as 1-2-3!

Only the M.S.A. DRIVER uses an integral stud-piston and cartridge assembly that prevents ricochet, flash, recoil and disturbing noise. Only the M.S.A. DRIVER is built by the world's largest manufacturer of industrial safety equipment. Write for the facts—ask for a demonstration!

Operator firing ¼" threaded stud through bottom flange of metal door frame into concrete floor.

Door frame in place, held by 4 Velocity-Power studs—ready for tile-block installation.

MINE SAFETY APPLIANCES COMPANY
BRADDOCK, THOMAS AND MEADE STREETS · PITTSBURGH 8, PA.
At Your Service:
54 BRANCH OFFICES IN THE UNITED STATES AND CANADA

Specify National INSULATING MATERIALS

For Long Life and Reliability

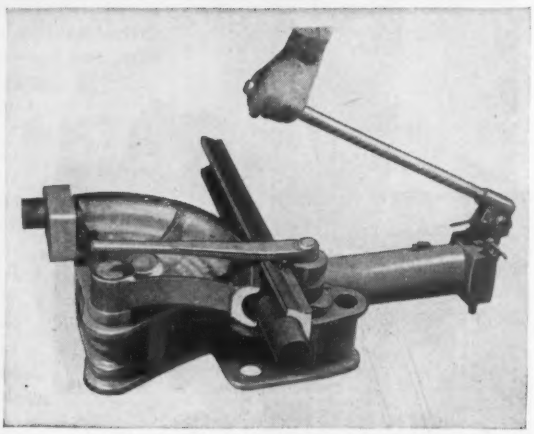
Adhesives
Cements
Compounds
Enamels
Fabrics
Fiberglas
Laminates
Mica Products
Papers, Fibres
Silicones
Sleevings
Tapes
Tubings
Varnishes

If you have a *special* electrical insulation problem — heat, moisture, oil, acid, etc. — which causes persistent trouble — *that's* where we shine. For years and years we have studied the problems of the man who has more than the ordinary insulation problem. We have found ways to lengthen insulation life under adverse conditions. We developed Mica-Glas, all-inorganic. We were among the first to apply the advantages of silicone to insulation. Then, to bring such experience to you we placed factory-trained engineers in the field. One is near you *now*, waiting not just to sell insulation but to help you profit by its use. Use him. Tell him your problem. He's equipped to solve insulation problems, and that's his job. Call him in; if you don't know him, write or wire us.

NATIONAL ELECTRIC COIL COMPANY
COLUMBUS 16, OHIO, U. S. A.
ELECTRICAL ENGINEERS MAKERS OF ELECTRICAL COILS AND INSULATION — REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES
TRADE MARK

Designed for your need — the new TAL E.M.T. Bender

pays for itself in the time that it saves.



Also attachable to Tal 2" or 3" Pipe or Conduit Benders.

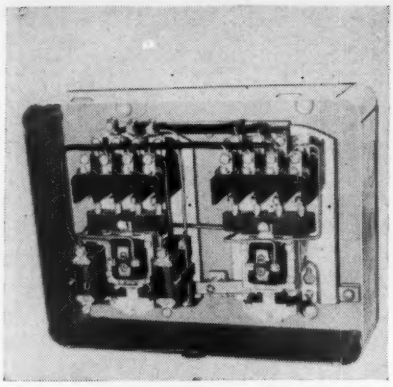
Think what you can do with this new portable machine that bends all types of thin-walled tubing on the spot:

- free from kinks
- free from wrinkles
- no shifting of tubing
- easy to operate
- less than one minute required to make any bend in one single setting

Anyone can handle this machine — even inexperienced labor — and do in seconds work that requires minutes with other equipment. It comes packed in a handy tool box — and because the frame, formers and bars are made of a lightweight alloy, one man can carry it easily.

Write today for full information.

TAL Bender, Inc. Dept. 21 **Milwaukee 2, Wis.**



Starters

A new line of a-c magnetic reversing starters has been developed. Designed for industrial control applications such as machine tools, woodworking machines, etc., these starters with three poles are available for across-the-line starting and reversing of polyphase motors to 200 hp., 550 volts, 60 cycles. Four pole starters with ratings of 7½ hp., 550 volts, 60 cycles maximum are suitable for use with externally reversible single phase motors of the four-wire split phase, capacitor or repulsion induction types. Starters consist essentially of two magnetic contactors interwired for reversing operation, mechanically interlocked, with or without thermal overload protection. Ward Leonard Electric Co., Mount Vernon, N. Y.

Surface Wiring Box

A new brown shallow surface wiring box, No. 5020, has been announced. It is 1⅜ inches high. Box dimensions fit standard handy type box covers. It is designed to accommodate all but the largest bodied duplex receptacles and toggle switches. Box is for use with Nos. 12 and 14 non-metallic sheathed cable. Union Insulating Company, Inc. P. O. Box 351, Parkersburg, W. Va.

Motors

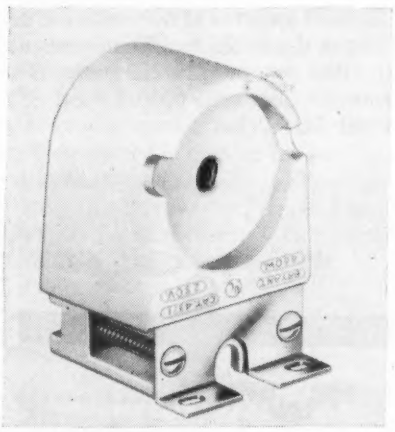
A new line of integral hp., single phase motors has been announced. The centrifugal switch formerly used to disconnect starting condensers from the line after the motor is up to speed has been replaced by a voltage relay. Relay is mounted in control cabinet furnished with motor. Motors are built in capacitor start, induction run types in ratings of 1 and 1.5 hp., and in capacitor start, capacitor run types in ratings of 2, 3, 5, 7.5 and 10 hp. The line is available in open drip proof; splash proof; totally enclosed; fan cooled; and explosion proof construction. The Louis Allis Co., Milwaukee 7, Wis.

Plastic Sleeve

A new thin type of plastic sleeve which gives permanent identification to tubing, wires, cables, hose, conduits, couplings, etc. has been developed. Made of cellulose acetate butyrate, approximately .013 of an inch thick, it is available in extruded colors in code or plain patterns. Desired printing, hot stamped into plastic material, is resistant to normal abrasion, hydraulic fluid, gasoline, alcohols, water, etc. An applicator is available for applying bonding material. Topflight Tool Co., Inc., York, Pa.

Trouble Light

A portable, retractable trouble light, known as Retracto-Reel, with fingertip control, is available. This insulated caged light, which can be interchanged with a female plug for use with power tools, has a radius of 25 or 45 feet from its durable reel rack. A retractable neoprene - jacketed kink - proof cord plays out and automatically locks at the desired length. The three semi-suction cup rubber feet provide scratch-proof protection. M. Black Manufacturing Co., 300 North Third Street, Philadelphia 6, Pa.



Lampholders

New lampholders, Nos. 4371 and 4372, for the T-12 (1½ inch) slimline fluorescent lamps have been announced. They are equipped with removable brackets which permit mounting in any one of four positions — with the brackets at the front or back and for recessed or surface mounting. They may also be "butt-on" mounted against an end plate in which case the bracket is not required. They are made of white bakelite and supplied in matched pairs for high and low voltage ends. Lamp must be in place in both lampholders to complete high voltage circuit. Bryant Electric Company, Box D Barnum Station, Bridgeport 2, Conn.

"Fastens quicker than lightning"

says JOE RAMSETTER

Slash fastening time and costs—set steel pins and studs instantly into steel or concrete with RAMSET SYSTEM

In 30 seconds, from start to finish, you can "nail" wood, steel and other hard materials to steel or concrete. You can set threaded studs for an endless variety of fastening jobs.

Cut costs! Users show savings up to 60% in time and materials over old-fashioned methods.

Save time! Get your work finished amazingly faster. Avoid costly delays caused by time-consuming drilling and plugging.

Easy to use! Light, compact RAMSET TOOL requires no electric or air lines—it's self-powered. Any good workman can learn "Ramsetting" in 30 minutes—and can set up to 50 fastenings in an hour.

Get details! Ask for 15-minute demonstration of how RAMSET SYSTEM can save you time and money—get your work completed faster, more profitably. Use the coupon.

Ramset FASTENING SYSTEM

Stemco Corporation, Cleveland 16 (Rocky River), Ohio.

In Canada—Globe Machine Tools, Batawa, Ontario.

MAIL THIS COUPON EC-6

Stemco Corporation,
Cleveland 16 (Rocky River), Ohio

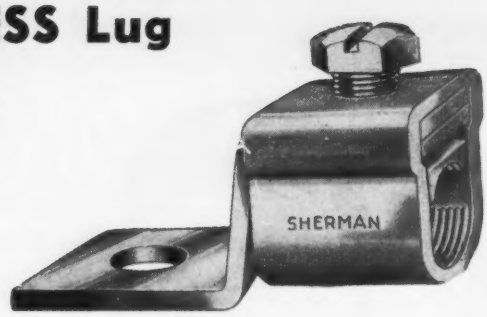
Please send details and arrange 15-minute demonstration of RAMSET FASTENING SYSTEM. No obligation, of course.

Name_____

Company_____

Address_____

The SOLDERLESS Lug That *Speeds Up* The Job!



Sherman S-O Solderless Lug

Part No.	Max. Amp. Cap. N.E.C.	Range Wire Sizes Max.	Min.
SO-8	35	8	14
SO-4	70	4	14
SO-1/0	125	0	3
SO-4/0	225	0000	0
SO-500	400	500M CM	250M CM

You can make fast time and do the job right when you use this big, strong Solderless Lug.

That big hex head can be tightened with wrench, pliers, or screwdriver. The screw forces a movable pressure plate down on the wire. No chance for the wire strands to separate. The pressure plate, which is the full length of the barrel, grips the strands between large, serrated surfaces, insuring a mechanically strong, electrically efficient connection.

Try Sherman Lugs. It Pays!

H. B. SHERMAN MFG. CO.

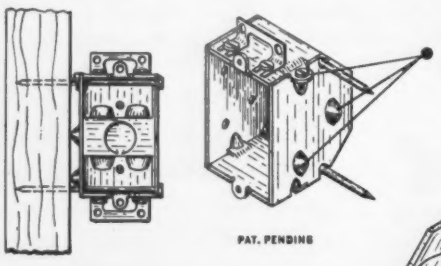
Battle Creek, Michigan

Sherman

ELECTRICAL FITTINGS

STEMCO boxes... contractors' choice for speedy accurate installations

The new STEMCO nail type boxes incorporate the simple design features that speed and facilitate easy accurate installation. No tilting boxes, no shimming, no fighting pryouts.



THE LEVELING BUMPS MAKE THE DIFFERENCE

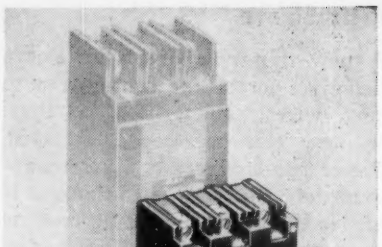
Three point mounting insures perpendicular boxes.

PRY DOWN, TWIST OUT

Fast simple pryouts with a solid pryout heel.

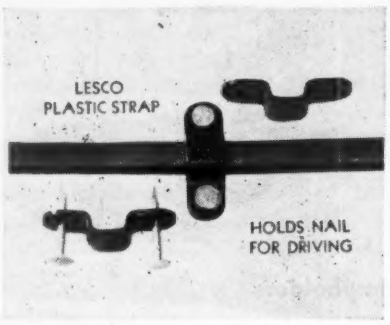
STANDARD ENGINEERING and MFG. CO.

DENVER, COLORADO



Circuit Breaker

A new 50 ampere, 600 volt and 100 ampere, 250 volt circuit breaker has been announced. This ML-1 breaker includes all construction features of the smaller ML and larger ML-2, ML-3 and WL breakers. Unit is available as either a circuit breaker or a circuit interrupter of high interrupting capacity. Thermal-magnetic (coilless) tripping mechanism is built into the ML-1. A thermal element holds harmless momentary overloads, but trips before wire insulation overheats on continuous overloads. It is available in all types of special enclosures. Enclosures include dust-resisting, rain-tight, weatherproof and dust-tight, and explosion-resisting styles. Ampere range is 15 to 50 amperes at 600 volts a-c or 250 volts d-c or 70 to 100 amperes at 250 volts a-c or 125/250 volts d-c. Square D Company, 6060 Rivard St., Detroit 11, Mich.

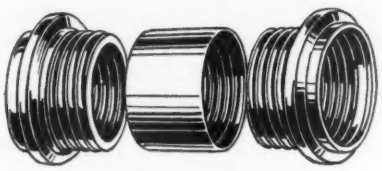


Plastic Strap

A new plastic strap for wiring has been announced. Strap is of conventional type for two hole installations and fits several sizes of cables, wires, etc. especially adaptable to neoprene barn wires, Romex, BX cable, cords, ground wires, copper tubing, entrance cable, radio wires and control wires. Complies with REA wiring requirements for a non-corrosive strap for fastening wire in wet, acid, and corrosive locations, such as buildings housing livestock. Lesco Products Company, 1624 Harmon Place, Minneapolis 3, Minn.

Fire Alarm System

A new fire protection for home and farm is offered in the "Wak-Em" fire alarm system, operated through a series of highly sensitive heat detectors connected in circuit to a loud, four inch fire alarm gong. Complete kit, containing alarm gong and five heat detectors, is sufficient to handle average house. Additional heat detectors and transformer (required only when additional wiring cannot be accommodated by doorbell transformer) are made available. Heat detectors, sensitive thermostats, are mounted in thin brass housings. Brass, acting as a heat collector, accelerates action of thermostat. Carries UL approval. David Mfg. Co., Plano, Ill.



Coupling and Connector

A new ¾ inch EMT coupling, No. 311 has been announced. It eliminates the need of special tools and was designed to screw in on straightaway jobs with a twist-of-the-wrist, and snap in on corner jobs. A new ¾ inch connector, No. 11, is also available. Interior stainless steel lock washer holds tubing securely, makes uniform, safe, permanent, vibration proof 6-point ground around entire tube. Raintight, connector is suitable for outdoors and in concrete slabs. No inside ridges to snag fish-tape or fray wire. Tomic Sales and Engineering Co., 4864 Woodward Ave., Detroit 1, Mich.

Transformers

A new line of three-phase CSPB transformers have been announced. Designed for four-wire, 208Y/120 volt secondaries, they make possible three-phase banked-secondary operation without the possibility of cascading or reverting to radial operation. When used in banked-secondary system they reduce light flicker resulting from motor loads, increase service reliability, and reduce necessary installed capacity. Features of the CSP and single-phase CSPB transformers such as "loading by copper temperature" and integral surge protection are incorporated within the transformer itself. They are available in the 75 kva. rating in standard high voltage ratings from 2400 to 14,400 volts inclusive. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, Pa.

LOOK FOR EXTRA QUALITY WHEN YOU BUY FUSES

You no longer have to accept products that meet only minimum requirements. You can demand and get the best buy . . . the product that gives you more for your money. Pierce is the best buy in fuses. It costs you no more to get these *three extra* protection features.

PROTECTION AGAINST BLOW FROM HARMLESS SURGES

Pierce "Balanced Lag" link sustains harmless jolts and surges in the working overload range which often blow ordinary fuses. Yet it blows instantly on dangerous short or ground. By sustaining all safe loads, blowing only when danger threatens, "Balanced Lag" eliminates costly, unnecessary power interruptions.

PROTECTION AGAINST CASE FAILURE

The strong tubular bridge construction and simplicity of design in Pierce fuses ensure maximum case life and clip contact, and prevent the misalignment common to ordinary fuses.

PROTECTION AGAINST AFTERBLOW

Pierce fuses are screen-ventilated and operate from 10 to 50 per cent cooler, preventing unnecessary blow from stored or secondary heat held in ordinary fuses.

PIERCE

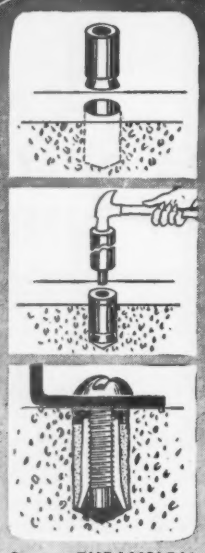
For Forty Years, Specialists in the Design and Manufacture of Fuses

RENEWABLE FUSES, INC.

177 Pacific Avenue ★ Buffalo 7, N. Y.

TRADE ARRO MARK

MACHINE SCREW
EXPANSION
ANCHORS



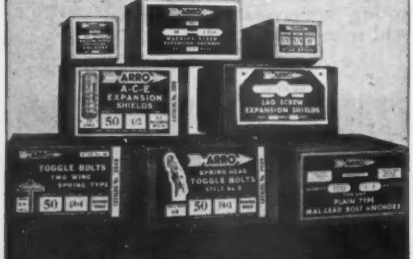
Drill hole and place tapered end in hole.

Drive lead sleeve in place with setting tool and hammer.

Install work and fasten with standard machine screw.

ARRO Machine Screw EXPANSION ANCHORS are easy to install and provide a dependable anchorage for the work in brick, concrete and other solid materials. Yet, the work can be dismantled and reassembled at will without destroying effective anchorage. Typical ARRO quality includes: sturdy construction, best materials obtainable, expert workmanship, long life service. In sizes from 6-32 screws to ¾" bolts inc.

Sold only through jobbers



ARRO EXPANSION BOLT COMPANY
MARION, OHIO

Switching Mechanism

A new pole-base switching mechanism has been announced. Unit is especially designed for ground control of pole-mounted, gang-operated, oil fuse cutouts of any rating, and is available for either 2 phase or 3 phase installations. Mechanism can be used with cutout installations on poles of any height by a field adjustment of the vertical operating member. Metal "on" and "off" nameplate are provided at hand-operated lever which permits an operator to determine position of cutouts from pole base. All parts are protected from corrosion by a hot dip zinc finish. General Electric Company, Schenectady 5, N. Y.

Wireway

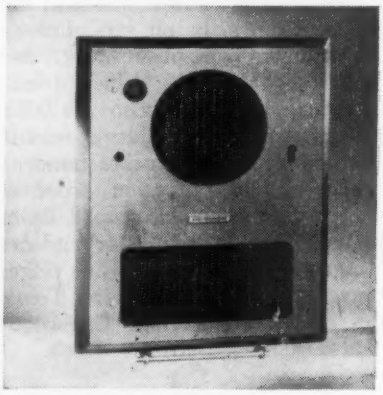
A new flangeless wireway has been announced. It is made in two sizes, 4 by 4 and 6 by 6 in 1, 2, 3 and 4 foot lengths. Along the sides are knockouts every 3 inches, providing openings from ½ inch to 1¼ inch, so connections can be made without drilling. Cover is fastened by screws. Connections with other sections are made with U-connectors, interchangeable closing plates, used at the end, have combination knockouts that will accommodate pipes up to 2½ and permit connections to be made to panel or meter boards without cutting. Keystone Manufacturing Co., 23328 Sherwood Road, Center Line, Mich.

Current Limiting Device

A new high interrupting capacity, current limiting device, for protection on low voltage circuits, known as Amp-Trap, has been announced. It protects metal clad switchgear, bus ducts, circuit breakers, fuses and current transformers against damage by short circuit currents. It is supplied in all ampere sizes from ¼ ampere to 4000 amperes, for a-c circuits up to 600 volts, any frequency, and for d-c up to 750 volts. On Amp-Trap the arc gap is very short, and the cross-section of arc-path itself is very small, and consequently of high resistance. A potential drop across the arc is instantaneously established at a value equal to or greater than the circuit voltage, and the flow of current is cut off in a matter of micro-seconds. It can be used on old systems and new installations. The Chase-Shawmut Company, Newburyport, Mass.

Fluorescent Fixtures

Innovations and improvements to the "Lytron" series of fluorescent fixtures have been developed. They include the "SoloStall" hanger, a new 25 watt size, two and four light Lytrons with slip-on, snap-on parts, a new one-tube bracket with a decorative shield, and a new "Circline" series. Two innovations in the one-light series are a new bracket featuring a ceramic-textured glass shield; and a new 14-watt size, 23⅝ inches long, to fit standard bathroom mirrors. All fixtures are available with or without a switch and convenience outlet for appliances. Lightolier Inc., Jersey City, N. J.



Wall Heater

Development of a self-contained thermostat for the bilt-in-wall down-flo heater now provides automatic control of room temperature. The thermostat dial may be set to any desired temperature over an operating range of 55 to 85 degrees. It is made up of a heavy duty switch combined with a sensitive bulb. Switch is operated automatically by hydraulic pressure changes in the bulb. With the down flo principle, air is drawn in at the top of the heater, passes through 480 to 680 square inches of heating element, and warmed, fan-circulated air is forced out at the bottom at a rate of 125 to 160 cubic feet per minute. Model WA-12 is available in all popular sizes, with the following specifications: 1500 to 4000 watts, 115 to 230 volts, 5122 to 13660 B.t.u. Electromode Corporation, 45 Crouch Street, Rochester 3, N. Y.

Annunciator

A new supervisory annunciator, No. 1518, that gives both visual and audible alarm when trouble develops, has been announced. When trouble occurs this bull's-eye lamp type annunciator receives an electrical impulse from a normally open or normally closed, momentary contactor, such as a thermostat or float switch. This impulse causes a maintaining contact in the annunciator circuit which operates a visible signal indicating on the board where trouble is developing, and simultaneously, sounds an audible alarm. It is designed for flush, surface or panel mounting, open or closed circuit operation, on voltages from 24 to 250 volts, a-c or d-c as specified. Audible signal is a 3 inch heavy duty bell or horn, for external mounting. Visible signals are 1 inch bull's-eye lamps, electrically operated, electrically held and self-sealing in operating position. Auth Electric Com-Company, Inc., 34-20 Forty-Fifth St., Long Island City 1, N. Y.

Infra-Red Drying Unit

A new 6-light infra-red portable heating and drying unit has been introduced. Unit is designed especially for heating and drying purposes in automotive, electrical and manufacturing fields. Containing 6 Nalco inside- aluminumed, self-reflecting type lamps, units are adjustable in height from 18 inches to 6 feet, and mounted on four free-moving casters. Assemblies may be tilted to any angle or swung in a vertical or horizontal position for concentrated heating and drying. Two or more units can be combined to form continuous banks. North American Electric Lamp Co., 1044 Tyler St., St. Louis, Mo.

Saw and File

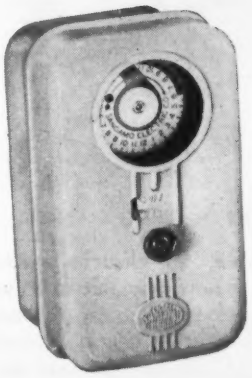
Recently redesigned and improved, Key-Hak is a portable saw and file to do the work of the hack-saw and the key-hole saw. It will cut through all metals including plate-stock, stainless and all sorts of metal sheet-stock in either straight line or radius cuts. In addition, it will cut through transite, masonite, bakelite, celotex, rock or asbestos board, beaverboard, plasterboard, corrugated metal, pebble-coated asphalt roofing, plywood, hardwoods, non-vitreous clay or metal tile, plaster and rubber. It attaches to consumer's own electric or air drill or motor driven flexible shaft of either ¼ in. or ⅜ Jacob's chuck capacity. Producers and distributors, Inc., 4015 MacArthur Blvd., Oakland, Calif.

Sangamo Type T Timers

Small in size, but BIG in Quality; High accuracy at Low Cost — all features that you can offer when you sell the new Sangamo Interval Type Timer. While primarily designed for positive attic fan control, these timers are suitable for many other applications.

Sangamo Type T Timers are extremely attractive in appearance, may be either wall or switch box mounted, and are fully guaranteed and priced right! Bulletin 1070A tells about them.

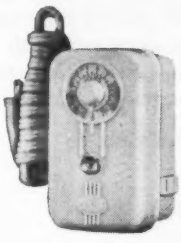
SANGAMO TIME CONTROLS



Sangamo Type S Time Switches

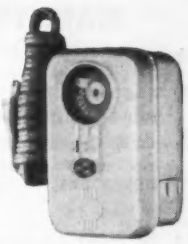
You can get more business with these fast-moving, precision-built, small sized time switches. Their high quality, small size and low cost permit the convenience of automatic control in many new time switch applications. Make extra sales by stocking and *pushing* Sangamo Type S Time Switches. They are available for immediate delivery. Bulletin 1053A gives complete information.

An attractive counter display is available to help you sell more Type S Time Switches. Ask for this business-getting sales help for your counter. Write today.



The Sangamo Timer is also available in a portable "plug-in" type (Type TJ), rated at 10 amperes or ¼ h.p. at 120 volts A. C., for temporary appliance installations.

Sangamo also offers a new portable "plug-in" Time Switch. The Type SJ, rated 10 amperes or ¼ h.p., at 120 volts A. C. Just plug it in and it goes to work.

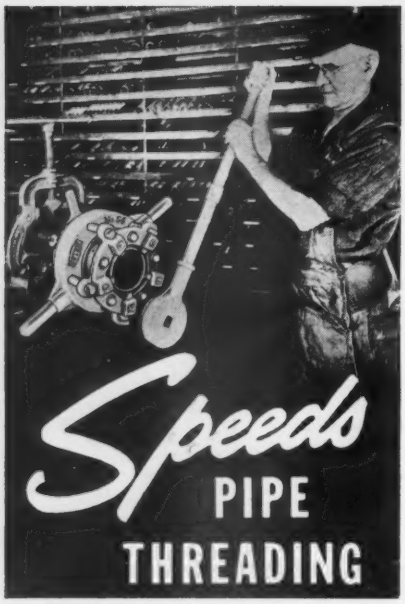


SANGAMO ST4913

ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

50TH ANNIVERSARY SANGAMO 1899 - 1949



NEW GEARED RECEDING DIE-STOCK

Here's a real tool! . . . the new Oster No. 54 "LEADER" Geared Receding Die-Stock. Used with ratchet handle for hand operation (as illustrated) it takes over the biggest part of the job of hand threading 2½", 3", 3½" and 4" pipe.

Its super-strong construction makes it the ideal threading tool for power drive operation. *Drive gear has a tensile strength up to 60,000 pounds per square inch!*

Steel pinion runs in needle bearings. That feature assures easy operation with a minimum of friction. Those and other features of the new Oster No. 54 "LEADER" challenge comparison with any geared receding die-stock in its capacity range.

Another NEW Oster Tool!

If you want the "TOPS" in a receding die-stock for threading 1" to 2" pipe, buy the new Oster No. 52 "LEADER". It's a HONEY for fast, easy operation!

Fill in the form below for complete information.

MAIL IT TODAY!

THE OSTER MFG. COMPANY
2081 East 61st Street, Cleveland 3, Ohio
O. K. Oster! Send me all the facts about your new No. 54 and No. 52 RECEDING DIE-STOCKS.

My Name .....
Company .....
Street .....
City ..... State .....

OSTER

Box Support

A new outlet box support for outlet boxes in old work has been announced. It supports No. 3 inch, 4 inch boxes, ceiling panel and 4 inch square boxes. To install cut opening for box, clip off plaster clinchers where bar hanger contacts lath; slip offset bar in and over opening, tip on side, insert spindle in opening on side and put into bar hanger, tip up and center over opening, turn spindle clockwise until unit is held tight. Fasten outlet box to center stud by means of locknut. Unit comes set for 1½ inch deep boxes, with spindle to length for 8 inch joists. Lesco Products Company, 1624 Hamon Place, Minneapolis 3, Minn.

Garden Light

The Floralite, an electric garden lighting unit, is now available in an assortment of models. Seven existing types consist of the original model available in 15, 30 and 60 foot cord sets; the Add-A-Floralite with receptacle in base for connecting a number of units together with but one cord to the electrical outlet, also available in 15, 30 and 60 foot cord sets; for permanent installation a special model with a special fitting for use with U.S.E. No. 14 2-conductor twisted pair trench wire. Inside frosted, clear glass globes make possible many lighting effects with the use of colored lamps. Steber Manufacturing Co., Broadview (Maywood P. O.), Ill.

Fish Tape

A new fish tape, called "Coil-Flex," has been announced. It can be used in all types of conduit, including aluminum. Flexible, it can be pushed or pulled through any and all bends allowed by the electrical code. Its round surface is easy on hands. Ends are smooth and round to avoid catching or snagging. Prevents cutting or damaging of aluminum conduit. "Coil-Flex"

MINERALLAC
Perforated
STRAP
Versatile Hanger Iron

Safely supports hanging pipes, conduits and cables up to 500 lbs. Made of ¾-in. 18 gauge electro-galvanized steel (also available in Everdur, copper, brass or aluminum). Precision made — perforations do not vary. ⅜-in. holes on ½-in. centers. Comes in 10-ft. coils and 5 and 10-ft. straight lengths. Available in other lengths also.

Send for literature and prices

Specify **MINERALLAC**
HANGERS, CLIPS,
STRAPS, BUSHINGS

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MINERALLAC

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EARL CORTRIGHT, Owner, Cortright Electric, Ithaca, New York, is a veteran of over 25 years in the electrical contracting business. Like others, Mr. Cortright has found that it's profitable to sell these outstanding products to provide comfort and health in the huge, industrial, commercial and institutional markets. He has also found that installing Herman Nelson Propeller Fans results in satisfied customers who help bring his firm more business. If you are interested in this profitable market, write for booklet, "1001 Ventilating Problems solved".

Herman Nelson Propeller Fans

THE HERMAN NELSON CORPORATION
MOLINE, ILLINOIS

consists of a 25-foot length of steel spring 3/32 inch in diameter with a rust-proof inner steel cable. A threaded male fitting on one end and a female fitting on the other makes it easy to join together two or more lengths. Ideal Industries, Inc., 1041 Park Avenue, Sycamore, Ill.

Loudspeaker

A new flame and explosion-proof loudspeaker has been announced. Unit may be used in mines, gasoline cracking plants, refineries, chemical plants and areas, munition mills and elevators, and military uses. It is incapable of igniting gases or dust surrounding loudspeaker should a breakdown in voice-coil or field-coil occur. Available in waterproof, fungus-proof, bug-vermin-mouse and rat-proof models. Also available in both permanent magnet and electro-dynamic models in sizes from 3 through 12 inch diameter, round, and also 4 to 6 inches and 6 by 9 inches oval shapes. The Signet Development Co., 188 West Randolph St., Chicago 1, Ill.

New Equipment Briefs

The new Positect is an enclosed bayonet-type **cutout** and **switching device** manufactured by S&C Electric Company, Chicago. . . . Minnesota Mining and Manufacturing Co., St. Paul, Minn. has announced a new "Scotch" brand **electrical tape** No. 33 for temperatures as high as 176°F. . . . Cannon Electric Development Co., Los Angeles, Calif., has redesigned its Vibrationproof Series of AN-type **connectors,** adding radio-shielding, pressurizing, moisture-proofing.

A new **instrument,** Beta-Ray Thickness Gage, designed to measure continuously the thickness of sheet material moving along a conveyor without contacting or disturbing the material, has been announced by General Electric Company, Schenectady, N. Y. . . . A new line **voltage tester,** known as Polyvoltester, for electricians is available from Fox Valley Instrument Co., Ingleside, Ill. . . . A new series of forced air electric **wall heaters** is now being manufactured by Markel Electric Products, Inc. and La Salle Lighting Products, Inc., Buffalo, N. Y.

W. H. Brady Co., Milwaukee, Wis. has announced new self-adhesive "Quik-Label" pipe **markers** for accurate identification of materials carried in pipes. . . . Bronze **ground clamps** have been announced by Mercury Electric Company, Inc., New York City, Type XLV for No. 8, 6, 4 AWG bare copper wire, type XCV for No. 8, 6, 4 AWG bare armed wire, type XCVL for No. 10 solid to 3/0 AWG copper groudning conductors. . . . A new silicone **insu-**

PORCELAIN WIREHOLDER INSULATORS

MADE RIGHT BY
ILLINOIS

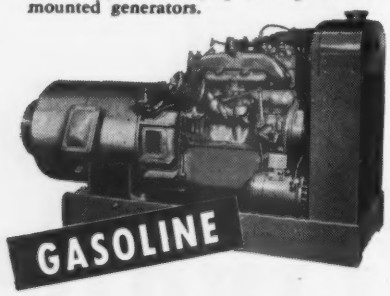
Illinois dry process wireholder insulators are uniformly made to meet exact specifications in sufficient styles and sizes for all requirements. Smooth, rounded surfaces protect wire insulation—deep, sharp screw threads assure easy and firm installation. Non-shrinking metal alloy binds screws permanently to insulators. Steel screws are evenly coated by special galvanizing process to prevent rust streaks on sides of buildings. Wet process porcelain supplied for primary circuits.

- HIGH MECHANICAL STRENGTH
- HIGH DIELECTRIC STRENGTH
- EXACT DIMENSIONS AND UNIFORMITY

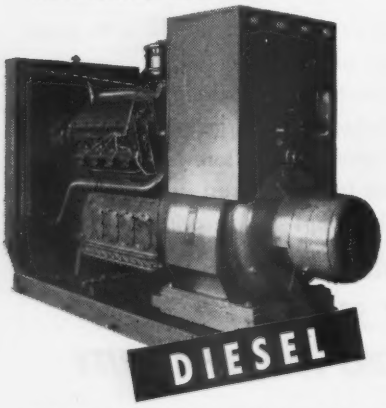
ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

For Built-in Dependability

You'll find the correct on-the-job power plant for your needs in the *complete* "U. S." line: from small units easily carried by one man, up to large trailer mounted generators.



From ½ kw up — A.C. and D.C. You can recommend these units with complete confidence. Their "built-in" dependability is the result of over 40 years manufacturing experience.



2½ to 140 kw, A.C. and D.C. All are full diesel, compression ignition, solid injection type. Write for information Please state type and capacity in which you are interested.

UNITED STATES MOTORS CORP.
580 Nebraska St. Oshkosh, Wis.
Foreign Division: 212 E. Washington Ave., Madison 3, Wisconsin, U.S.A.

lating resin designed to enable electrical equipment to operate at temperatures as high as 180°C has been announced by the General Electrical Company, Pittsfield, Mass. . . . The Morrison Carry-All, is a **service body** being manufactured by Morrison Steel Products, Inc., Buffalo, N. Y. to fit standard ½, ¾ and 1 ton chasses.

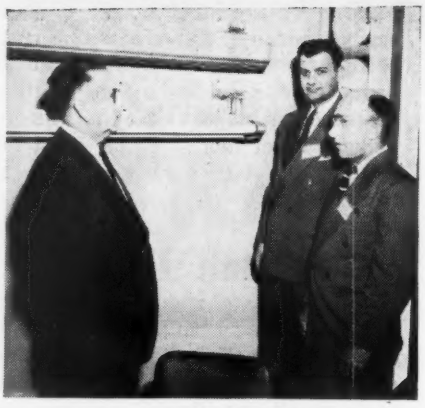
A new **analyzer** designed specifically for communication system maintenance —telephone, carrier current, and transmission line measurements—has been announced by the Weston Electrical Instrument Corp., Newark, N. J. . . . Micro Switch of Freeport, Ill. has announced a new BAFI-2RN **enclosed switch,** especially designed for severe service in industrial use. . . . Beaver Pipe Tools, Inc., Warren, Ohio, have recently added new features to the Model-A **pipe and bolt machine.**

The Turbothern REL-16A **insulated wire,** manufactured by William Brand & Co., New York City, is primarily of hook-up and lead character, carries 105°C rating, continuous operation for 300 and 600 volts. . . . Electric **soldering pliers** employing the current-resistance principle, has recently been placed on the market by the Durst Manufacturing Company, North Hollywood, Calif. . . . Designers for Industry, Inc., Cleveland, Ohio, has announced a new line of **Coaxial switches,** available with solenoid drive for remote control or with manual control for panel mounting.

Slater Electric & Mfg. Co., Inc., Woodside, N. Y. has announced a new **appliance switch** rated 15 amperes, 125 volts. . . . A new, small automatic **voltage regulator,** rated at 2 kva. output, has been announced by the Superior Electric Company, Bristol, Conn. . . . A new temperature compensated sensitive **relay,** developed for battery charge control, has been announced by Sigma Instruments, Inc., Boston, Mass.

The Megotron is an electronic rectifier type, dual voltage, three range **instrument** for use in measuring insulation resistance of power plant, substation and underground equipment. It is manufactured by J. W. Dice & Co., Grand-View-on-Hudson, N. Y. . . . The New England Carbide Tool Company Inc. of Cambridge, Mass., has announced the new, scientifically designed carbide-tipped **hammer bit** called Thunderbolt.

Reunion at NCEI convention in Minneapolis finds W. W. Wentz (left) head of Dunwoody Institute's electrical department, talking over old times with former student John Janzen—now an electrical contractor at Mountain Lake, Minnesota.



Lyn Buchta, B. & B. Electric Co., Freeport, Ill.; C. G. Parquette, Sylvania Electric Products Co., Chicago; and V. E. Bowen, B. & B. Electric Co., Freeport.

Micro Switch, Freeport, Ill. has announced a line of high capacity **precision switches** which widen the field of uses for small precision snap-action switches. . . . The DP **paint spray unit,** manufactured by Binks Manufacturing Company, Chicago is especially adaptable to maintenance work. . . . Glo-Switch Corporation, New York, N. Y. has announced a new **wall-switch** with a neon light in handle. . . . Extension of the use of the **electrically heated rubber** of the wire resistor type to industrial applications has been announced by the B. F. Goodrich Company, Akron, Ohio.

Sylvania Electric Products, Inc. has increased the efficiency of **blacklight lamps** through new improvements in its 360-BL series of blacklight fluorescent lamps. . . . A portable, heavy-duty aircraft **energizer,** designed to provide regulated 28½ volt ground power supply for starting all types of reciprocating engines as well as variable voltage power supply for starting jet engines, has been announced by General Electric Company, Schenectady, N. Y. . . . Mercury Electric Company, Inc., New York City, has announced improvements in their **solderless lugs.**

New high-voltage **selenium rectifier cells,** designed for a d-c voltage of 24 volts per cell, with an RMS a-c voltage of 33 volts per cell for singlephase bridge circuits, has been announced by Westinghouse Electric Corporation, Pittsburgh, Pa. . . . The new 26-R **pipe threader,** threads 1, 1¼, 1½ and 2 inch pipe with one set of dies. It is manufactured by Beaver Pipe Tools, Inc., Warren, Ohio.

Chelsea Fan & Blower Co., Inc., Irvington, N. J. has announced a new belt driven **fan** for mounting on outside window frame.

HOW MOTOR SHOPS SELL

[FROM PAGE 59]

Question 4. Which of these media gives you best results?

Total Number Answering—127

	1st Choice	2nd Choice	3rd Choice	Total
Direct Mail...	89	11	5	105
Calendars	1		2	3
Directories & Catalogs ...	19	21	16	56
Local Mag. or House Org..	3	5	4	12
National or Regional Mag..	8	10	3	21
Newspapers ..	22	18	10	50
Radio	2	4	1	7
Billboards	1			1
Others	2	1	1	4

Direct mail should, of course, head the list—if by results the respondents had inquiries in mind. There are many other ways to measure "results" of advertising beyond a tabulation of inquiries. The objective of direct mail is inquiries—good inquiries which can be converted into sales. Casual inquiries from poor prospects or from those who aren't prospects at all, are costly. They must be handled by someone. This involves time and money. There is an art to limiting inquiries only from those on whom you can afford to spend sales time.

Set up your objectives for each type of advertising. Measure your results with a yardstick that matches the objective.

Question 5. Who prepares your advertising?

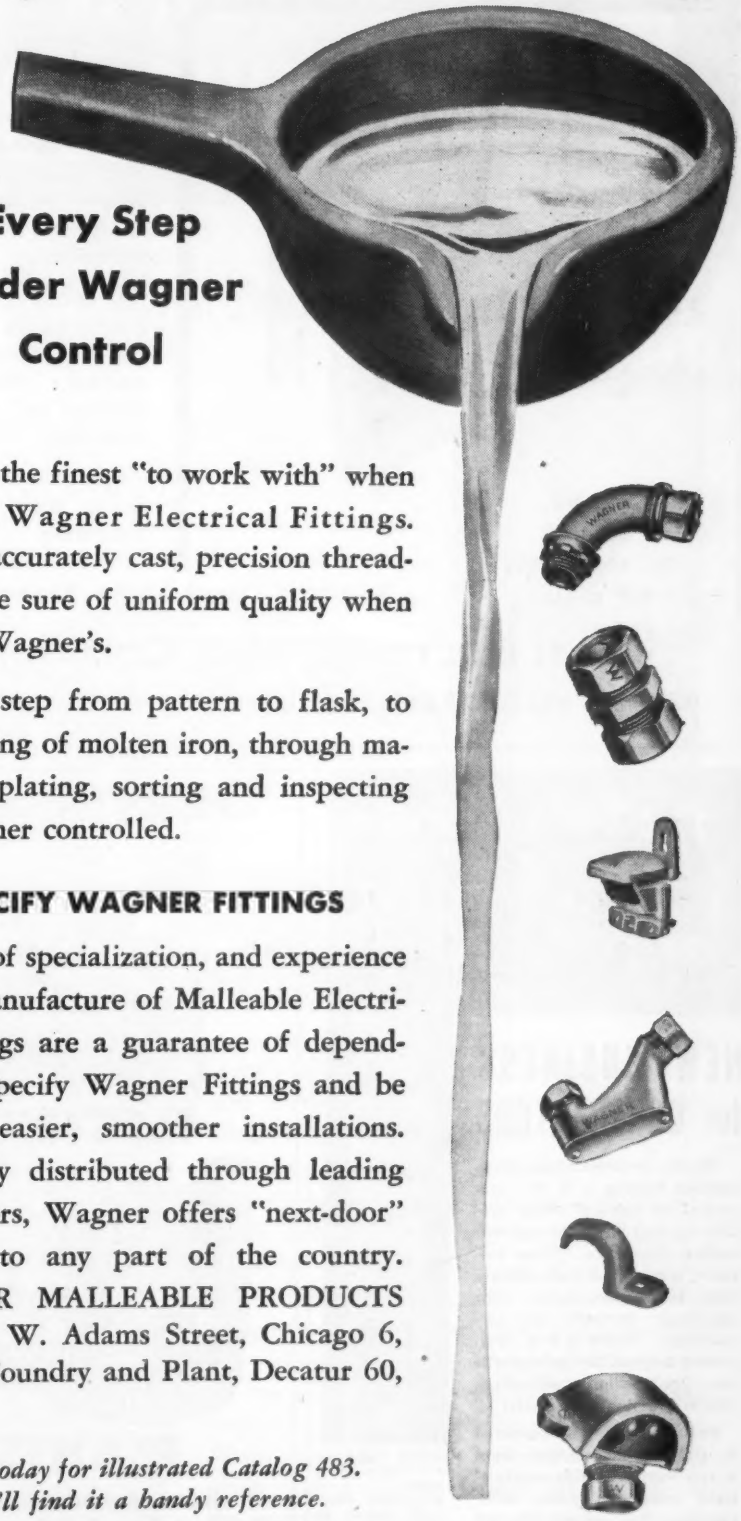
Total Number Answering—168

Your Own Organization. 141 mentions
Advertising Agency .... 39 "
Publisher's or Printer's Copy Service ..... 20 "
Others
- Help from distributor connections 2
- Telephone Co. 1
- Merchandise Mfgrs. 1

Advertising is a powerful force. It can be a very expensive and ineffective tool when not properly used. In this regard advertising is no different from anything else. An automatic turret lathe in the hands of an unskilled operator is costly, unproductive and even dangerous. So it is with advertising.

There are men in every community who, like yourselves, have established a service industry to help business men sell the goods and services more effi-

"From Molten Metal to Finished Product"



Every Step Under Wagner Control

You get the finest "to work with" when you use Wagner Electrical Fittings. Tough, accurately cast, precision threaded, you're sure of uniform quality when they're Wagner's.

Every step from pattern to flask, to the pouring of molten iron, through machining, plating, sorting and inspecting are Wagner controlled.

SPECIFY WAGNER FITTINGS

Years of specialization, and experience in the manufacture of Malleable Electrical Fittings are a guarantee of dependability. Specify Wagner Fittings and be sure of easier, smoother installations. Nationally distributed through leading wholesalers, Wagner offers "next-door" delivery to any part of the country. WAGNER MALLEABLE PRODUCTS CO., 222 W. Adams Street, Chicago 6, Illinois. Foundry and Plant, Decatur 60, Illinois.

Write today for illustrated Catalog 483. You'll find it a handy reference.

WAGNER
Malleable Fittings

Now Is The Time—
TO LIGHT UP THAT PLAY AREA

This MULTI open type floodlight is practically engineered to give maximum flexibility of light direction with simple methods of operation that are positive.

It's durable too — heavy gauge steel, finished in porcelain enamel. Mounting fittings are malleable iron.

Adaptable for cross arm and pipe mounting.

CAT. NO.
8088-B
750-1500 WATTS
18" DIAM.

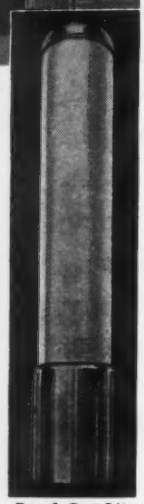
Distributed Through Leading Wholesalers

MULTI ELECTRICAL MFG. COMPANY
4223-43 WEST LAKE ST. CHICAGO, 24

NEW BUSINESS for CONTRACTORS

The big development in outside business lighting is to the "new method of lighting" made possible by Post-Lites, the new all-weather fluorescents. These dramatic, stream-lined lights radiate light in all directions. They completely dominate any surroundings. Visible a mile away. Attract business like nothing else can. One installation sells others. This is your big opportunity!

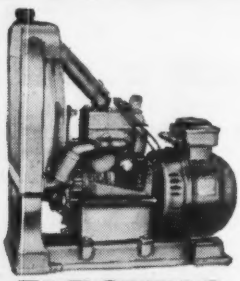
Post-Lites are well engineered by a 38 year old company. Good in zero weather. Wide variety of types install on posts, walls, corners. Mail coupon for new Catalog.



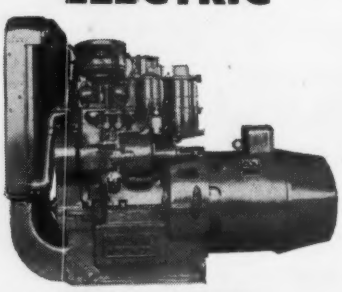
Round Post-Lites straddle pipe posts. Half-round Post-Lites mount on walls. Also other models

W. H. LONG CO., 108-114 W. Illinois St., Chicago 10.
Please mail Catalog and Prices.
Name .....
Address .....

UNIVERSAL



ELECTRIC



PLANTS

All sizes and types, gasoline and Diesel, A.C. and D.C., to 35 kw. For all purposes. Send for literature and prices!

UNIVERSAL MOTOR CO.
Founded in 1898
438 E Universal Drive, Oshkosh, Wisconsin

ciently. These men have studied and worked at sales promotion. They are, like yourselves, experts in their field, and they are just as serious in the desire to render a worthwhile service as you are. Why not make use of them?

You know that it is uneconomic for the average industrial plant, commercial establishment, or institution to maintain a skilled crew to do its own motor work. No one plant could afford to gather together the team of skilled men which you have organized. That is why your business exists.

The advertising agency business is an exact parallel. These firms exist because they can give a large number of businesses expert advertising service at a reasonable cost. You should consider making use of this service industry.

Question 6. How do you feel about your present budget?

Total Number Answering—162
Too Little 53
About Right 97
Too much 12

Skipping those who feel their expenditure is "about right", because the "status quo" always tops the replies in questions of this kind, the important point here is that four times as many feel they're spending too little compared with those who believe they're spending too much.

This is a very healthy sign. It indicates general satisfaction with results obtained from even a necessarily haphazard use of advertising. Think of what could be done with some concentrated, expert effort. The answer to this question also indicates that the selling is getting tougher—an awareness of the need to get out and start fighting for business.

A word on those who feel their budget is too high. They are probably right. In what they're getting, they're probably spending too much. A more efficient use of the same amount of money might well turn the tide here.

Question 7. How do you feel about advertising expense?

Total Numbering—159
Money Well Spent..... 146
Money Wasted 3
Necessary Nuisance 10

Just about all those who advertise feel that it's money well spent. This is a measure of the effectiveness of the advertising done. It also indicates that advertising can do a job in this industry. There is plenty of opportunity here for good advertising men to roll up their sleeves and go to work. The days ahead will need all of the effective tools of modern selling.

CHECKING WAVE-WOUND ROTOR CONNECTIONS

[FROM PAGE 65]

three. Between each group of three, there are six other clips or coils which do not light. These belong to phases B and C, and will light in groups of three when the test light is applied to phases B and C respectively. This test then proves the original grouping of three coils per group.

However, let us assume that the winder connected the coil in the bottom of slot No. 2 with the top of slot No. 11 when beginning his "start". The clip sequence will be as before, i.e., A_1, 2 series clips, A_2, and 6 series clips followed by A_4; 2 series clips and then A_3 followed by 18 series clips, etc. Now, when the test light is applied, the pattern is not symmetrical but very erratic. This is shown in Fig. 3 for phase A only. *When the pattern is not in accordance with the known grouping a wrong connection is immediately indicated.*

Figure 4 shows a complete diagram for a 3-phase, 60-slot, 8-pole wave-wound rotor. Here, the slots per pole per phase is equal to 2½, making necessary an odd grouping:

A C B A C B A C B etc.
3 2 3 2 3 2 3 2 3

When the light check described above is applied to phase A, the sequence is that shown in Fig. 5 designated by solid dots. This is in accordance with the proper grouping. Similarly, the test applied to phases B and C will show a symmetrical pattern for a properly connected winding.

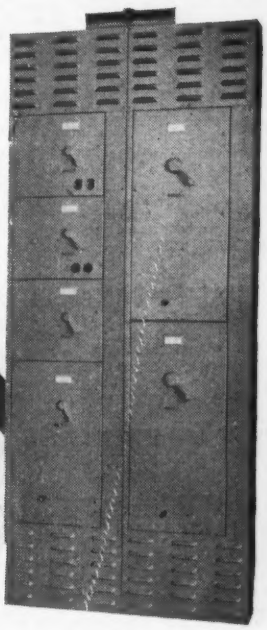
Proper connections of phase ends can be determined by the usual polarity checks used in connection with lap windings, and will not be discussed here.

The group test has been applied to many wound rotors and has ferreted out incorrect connections. It should be applied before the phases are interconnected, so that each phase can be tested separately. If the test is applied before soldering on clips, it is important to check the contact of each connection. The reversing jumper must also be applied, but this can be a temporary tie-wire bridging the two points.

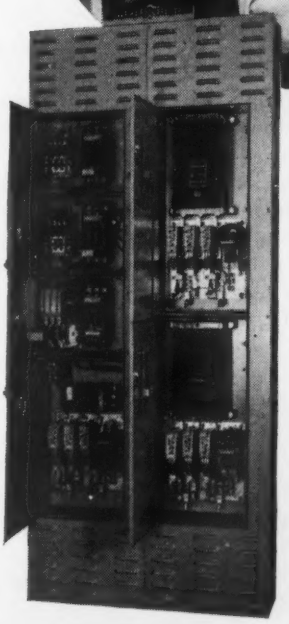
By opening a wound rotor at the star points, an existing wound rotor can be checked to determine its grouping, and consequently the number of poles for which it is wound. The test will be successful if there are no open circuits or grounds.

ECONOMIZE as you MODERNIZE

... GE Motor Control Centers



CONTROLLING motors on a process? Economize with standardized, pre-engineered and factory assembled G-E motor control centers. Vertical sections are only 12 inches deep. Standard starter units (NEMA Size 1, 2, 3, and 4 for 1 to 100 hp motors, 440 volts and below) are completely metal enclosed, have short-circuit and overload protection.

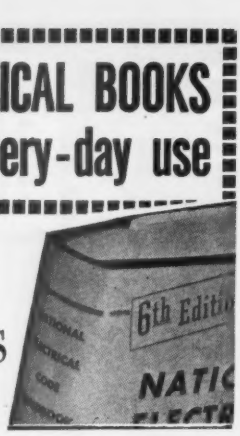


Save on wiring costs. Connections to incoming power from vertical bus bars are made in one quick shove by means of "clothespin contact", a special device on the back of each starter unit. Four screws hold unit in place. Wiring troughs are five inches wide, easily reached when cover plates are removed. Terminals are at top or bottom as you prefer. Everything front connected for flexibility of arrangement. Write for more details on these low-cost G-E motor control centers—Bulletin GEA-4979—at the nearest G-E office. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

5 PRACTICAL BOOKS for every-day use

• SEE THEM 10 DAYS FREE



1. NATIONAL ELECTRICAL CODE HANDBOOK

By A. L. ABBOTT—Restates involved rules in simple language, provides explanations, furnishes practical directions, and is filled with 418 diagrams showing what the Code rules mean and how to apply them. Ideal reference on questions of materials, plans, wiring and installation. **$4.00**

2. ELECTRICAL WIRING SPECIFICATIONS

Edited by EARL WHITEHORNE—Covers wiring for light, power, and signaling in industrial, commercial, and residential buildings; outlines an orderly procedure, and gives you standard Code rules, engineering data, and many diagrams to simplify your work. **$2.75**

3. AMERICAN ELECTRICIANS' HANDBOOK

By TERRELL CROFT—Packed with the facts which every electrician needs at hand. It gives you specific instructions for repairing electrical equipment as well as clear explanations of the fundamentals of electricity. Helps you select, operate, and install electrical materials more efficiently. **$6.00.**

4. MATHEMATICS for ELECTRICIANS and RADIOMEN

By N. M. COOKE—This guide teaches you mathematics from elementary algebra through quadratic equations, logarithms, trigonometry, plane vectors, and elementary vector algebra—and shows you how to apply it to radio and circuit problems. Over 600 illustrative problems, and more than 3000 practice problems. **$4.50.**

5. FLUORESCENT LIGHTING MANUAL

By C. L. AMICK—This Second Edition supplies up-to-date details on construction and performance of all types of fluorescent lamps. It presents the principles and methods of calculating illuminating requirements, designing luminaires and installations, and remedying their troubles. **$4.00.**

FREE 10 DAY EXAMINATION MAIL COUPON BELOW

McGRAW-HILL BOOK CO., INC.,
330 W. 42nd St., N.Y.C. 18

Send me books corresponding to numbers encircled below for 10 days' examination on approval. In 10 days I will pay for books I keep, plus few cents for delivery, and return unwanted books. (We pay for delivery if you remit with this coupon; same return privilege.)

1 2 3 4 5

Name .....

Address .....

City ..... Zone..... State.....

Company .....

Position EC-6-49

Books sent on approval in U. S. and Canada only.

SIGNALING AND COMMUNICATION [FROM PAGE 61]

set at either 165 or 212 degrees Fahrenheit as desired. The ratings are 24 to 125 volts a-c or 24 volts d-c 1 ampere; 125 volts d-c 0.3 ampere.

A bell of the explosion-proof and dust-proof type is shown in Figure 5. This device is approved under Class I, Groups C and D, and Class II, Groups E, F and G; and Class III. It consists of a heavy cast housing with mounting feet and a hub for three-quarter inch conduit. The cover and body are square and may be assembled to place the conduit hub on top, bottom, or either side as desired. The striker is located at the bottom.

The cover assembly, which includes the complete striking mechanism, gong and all electrical components, is fastened to the body with four heavy screws. Binding screw terminals are provided for the connection of the supply conductors. The bell may be supplied with 6, 8 or 10 inch gongs, vibrating or single stroke, over a voltage range from 12 to 230.

Vibrating horns of the explosion-proof and dust-proof types are available and approved under Class I, Group D, and Class II Groups E and G. The projectors may be had in three different types namely, the grilled face plate, and the single and double directional angular types. The general construction is similar to other signal units, and may be furnished with a splicing outlet box which is attached to the housing with a close nipple.

Small motor driven sirens of the explosion-proof type are available and are approved under Class II, Group F. These sirens have a heavy housing of non-corrodible material enclosing and sealing a one-third horsepower motor and wires extended to a splicing outlet box which is attached to the housing with a close nipple.

A synchronous motored clock of the explosion-proof and dust-proof type is shown in Figure 6. This clock is approved under Class I, Groups C and D; Class II, Groups E, F and G, and Class III. It consists of a heavy cast housing enclosing the synchronous a-c motor and electrical connections. The gear train is enclosed in a gasketed dust-tight chamber located directly in front of the explosion-proof housing and is attached to the back of the dial assembly.

Two styles of mountings are available, flush and surface. Either style may be flush mounted in a panel by us-

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction — Maintenance — Repairs

SCRU-ITS

U. S. Patent No. 1,933,555

SOLDERLESS WIRE CONNECTORS

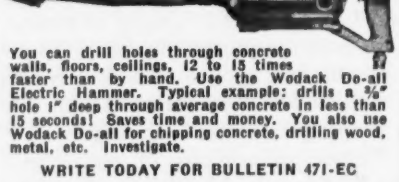
FAST! EFFICIENT! ECONOMICAL!

WRITE FOR DATA SHEET NO. 1095

SOLAR ELECTRIC CORPORATION
WARREN, PA.

How to drill Concrete

for expansion bolts, conduits, etc.



You can drill holes through concrete walls, floors, ceilings, 12 to 15 times faster than by hand. Use the Wodack Do-all Electric Hammer. Typical example: drills a ⅜" hole 1" deep through average concrete in less than 15 seconds! Saves time and money. You also use Wodack Do-all for chipping concrete, drilling wood, metal, etc. Investigate.

WRITE TODAY FOR BULLETIN 471-EC

Wodack Electric Tool Corporation
4627 W. Huron St. Chicago 44, Ill.

A GOOD Habit

The Where-to-Buy Section of Electrical Construction and Maintenance supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue—a *good* habit!

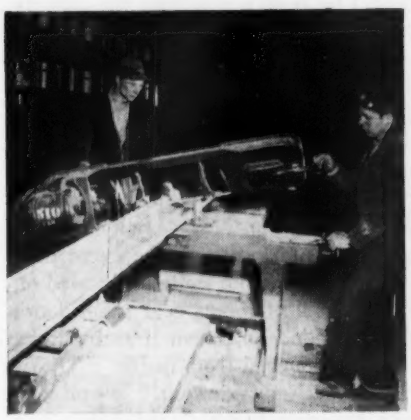
ing suitable supporting brackets. The same cover and dial assembly is used in either type of mounting.

The body for the flush mounted clock condulet is provided with a threaded adapter which allows a one-half inch adjustment. The conduit hub may be positioned at the top, bottom or either side. The body for the surface mounted clock condulet is provided with mounting feet and through-feed conduit hubs. A metal enclosure is provided between the wall and the back of the dial assembly and is notched for receiving the conduit.

Some telephones are available for use in hazardous locations and are approved under Class I, Groups B, C and D. They are equipped with handsets and the housings in general are constructed in a similar manner as for other signal equipment mentioned. There are still some other telephones of the sound-powered type which although at this time are not approved by the Underwriters as explosion-proof, do carry the approval of the U. S. Department of the Interior, Bureau of Mines.

Various types of contact-making-and-breaking devices of standard types approved for explosion-proof and dust-proof may be obtained. They may be of the pushbutton or switch type for operating audible or visual signals or a combination of both.

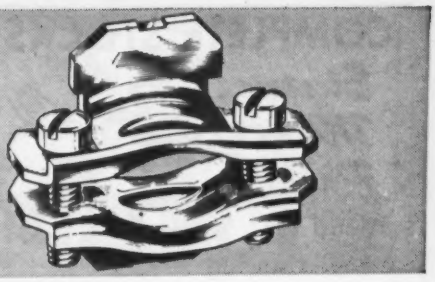
Standard individual explosion-proof housings may be procured for enclosing relays, resistors, fuses and terminals. They may also be used as junction and pull boxes.



Conveyor rolls and band saw speed fabrication of heavy duty bus duct during construction of ALCOA's new Davenport plant. Here a 20-ft. length of aluminum extrusion, forming one phase of a 3-phase sector bus, is being cut to length on field assembly line set up by Fischbach and Moore, Inc., project electrical contractors. Tallow candle forms good lubricant. Other sections of the line handle drilling and assembly of component parts of duct.

DO IT EASIER SAFER QUICKER with TOMIC Connectors and Couplings

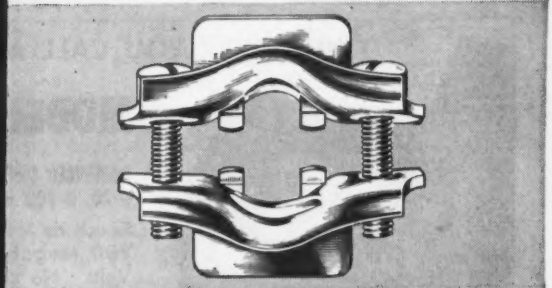
Everyone who has used them just once . . . never buys any others again! Ask for them by name at your wholesalers. Try them yourself. You'll know why they're America's fastest selling connectors and couplings!



TOMIC #100 and #200 CONNECTORS

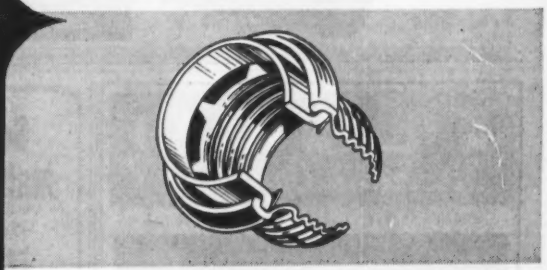
No. 100 Romex connector for ½" K.O. (old or new type.)

No. 200 Service entrance and range connector for ¾" K.O.



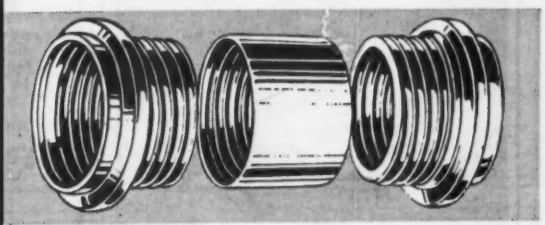
TOMIC #333 BX ARMORED CABLE CONNECTOR

For ½" K.O. and ⅜" Greenfield. Holds cable tight as a clam. No locknuts to lose. Underwriters approved.



TOMIC #10—½" EMT THINWALL CONNECTOR
TOMIC #11—¾" EMT THINWALL CONNECTOR

The easiest to install connectors made today! No inside ridges to snag fish-tape or fray wire. Just tap or push it on.



TOMIC #310—½" EMT THINWALL COUPLING
TOMIC #311—¾" EMT THINWALL COUPLING

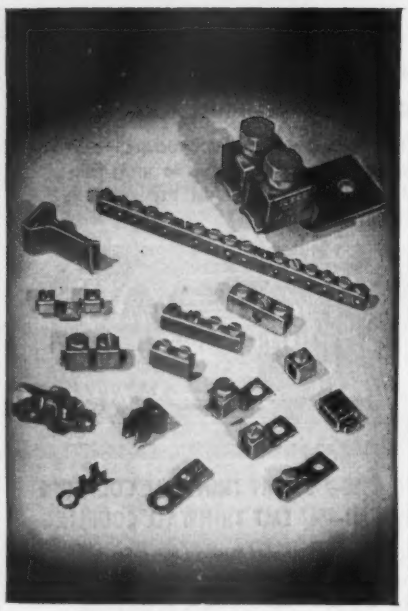
Screws in on straightaway jobs. Snaps in on corner jobs. No tools needed. The biggest improvement in coupling design in a century.

Tomic Sales & Engineering Co.
4864 Woodward Ave. · Detroit 1, Michigan

COMPLETE STOCKS
WESTINGHOUSE!
WAGNER! DELCO!
Electric Motor Parts
Send for
Your Catalog
On Your Letterhead
Today to . . .
The HARRY ALTER Co.
1728 S. Michigan Ave. Chicago, Ill.
134 LaFayette St. New York, N.Y.

WHATEVER YOU CALL AN INSULATION TESTER
THE NEW
MODEL B-7 MEGOHMER
IS TOPS
COMBINED PRECISION OHMMETER & MEGOHMMETER
0-20, 0-200 MEGOHMS. 0-200, 0-20,000 OHMS.
Reads as low as 1/10 of 1 Ohm to as high as 200 Megohms. 2 Test Potentials 250/500 Volts. No cranking, no wavering of pointer. Saves time and effort. Simplifies Insulation Testing. Ideal for low resistance testing too.
WRITE FOR NEW BULLETIN 440
HERMAN H. Sticht COMPANY, INC.
21 PARK PLACE, NEW YORK 7, N. Y.

ILSCO
Electrical Connectors



MANY TYPES AND SIZES
WRITE for 54-page
illustrated catalog.
ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

Solves the Problem of Mailing List Maintenance!

Probably no other organization is as well equipped as McGraw-Hill to solve the complicated problem of list maintenance during this period of unparalleled change in industrial personnel.

McGraw-Hill Mailing Lists cover most major industries. They are compiled from exclusive sources, and are based on hundreds of thousands of mail questionnaires and the reports of a nation-wide field staff. All names are guaranteed accurate within 2%.

When planning your direct mail advertising and sales promotion, consider this unique and economical service in relation to your product. Details on request.

McGRAW-HILL
DIRECT MAIL LIST SERVICE
McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd St., New York, 18, N. Y.

QUICK FREEZE AND COLD STORAGE WIRING

[FROM PAGE 57]

trical interlocking. Only one branch conveyor belt can be turned on at a time, thus preventing any confusion or tie-up on the main conveyor belt line.

The quick-freeze room, providing continuous freezing for foods to be packaged, is located in one corner of the large processing and packaging room. It has its own hydraulic and electric control panels, which are located on the exterior wall of the room, and fed from the main switchboard.

The mammoth below-zero storage rooms are insulated with eight-inch-thick rock cork in the floors, ceilings and side walls. These rooms are lighted with 100-watt incandescent lamps in vaportight fixtures, which are attached to conduit stems run through the insulated cork ceilings from a condulet fitting and conduit line installed above the ceiling. Thus the conduit system is kept outside the low temperature room except for the fixture stems which are sealed off from the main conduit line with Chico-X compound at two points; immediately above the vaportight fixture, and at the condulet.

Three-way switch control is provided for the storage room lighting, so that the lights may be turned on or off both inside and outside the rooms. This is a safety feature to prevent anyone inside the storage rooms from being left in the dark in case the lights should be turned off from the outside switches located alongside the main storage room doors. The emergency lighting and safety alarm switch locations which are inside of the sub-zero storage rooms have pilot lights that glow when other lighting is off. This enables anyone who might be inside of these rooms to locate switches and again turn on lights in the event they are turned off from switches located on outside wall of rooms near main door; also to sound an alarm if main doors cannot be opened from inside.

Also, each outside switch is equipped with a pilot light which indicates when the storage room lights are turned on. Temperatures in the storage rooms are usually maintained between zero and five below zero, but may readily and easily be dropped much lower.

The entire electrical system, including distribution system was designed, supervised and installed by the Electrical department of the Philips Packing Company.

WANTED

SALES REPRESENTATIVE

IN THE CHICAGO AREA

For well established, high quality standard conduit and EMT fittings. All items have trade acceptance, are approved and are entirely competitive in price.

Only established agents with following and similar lines in supply field will be considered.

RW-8985, Electrical Construction & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

SALESMEN:

All territories open for salesmen to call on electrical contractors and architects, (Experienced men preferred) with a complete line of Fluorescent and Incandescent lighting fixtures. Liberal commission. Protected territory.
APOLLO LIGHTING FIXTURE CO., INC.
214-218 S. Fourth Ave., Mount Vernon, N.Y.

CANADA

your NEW market

Market your product in Canada through a well known Canadian manufacturer. Has worked with Canadian electrical wholesalers since 1924 while marketing a product used by all phases of the Electrical Trade. For particulars, please write . . .

RA-8754, Electrical Constr. & Maint.
330 W. 42nd St., New York 18, N. Y.

WANTED

BY FITTING MANUFACTURER

LOCKNUTS

In sizeable quantities

ALSO FITTINGS OF ANY TYPE

To be branded or distributed

W-8986, Electrical Construction & Maintenance
621 S. Hope St., Los Angeles 14, Calif.

BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES

No lengths too long or too short
Telephone: Eastgate 7-4778
PIERCE CABLE CO.
2664 Clybourn Ave., Chicago 14, Illinois

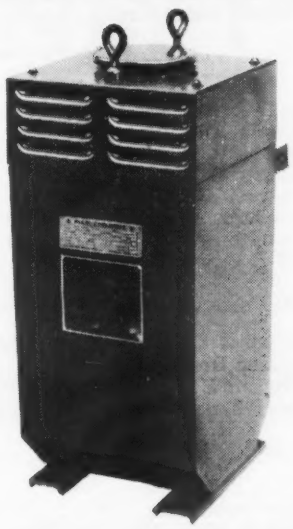
New "SEARCHLIGHT" Advertisements

received by June 22nd appear in July issue, subject to space limitations.
Address copy to the Classified Advertising Division
Electrical Construction & Maintenance
330 West 42nd St., New York 18, N. Y.

Special Offering!

2000 NEW

air cooled TRANSFORMERS



- **WILL OPERATE ON 220 AND 440 CIRCUITS**

All transformers insulated with fiber glass; no fireproof vaults required. For lighting and power.

★ **LOW PRICES** ★

KVA	VOLTAGE RATING
3/4 to 25	450 to 117
7½ to 25	225/450 to 117/234
PHASE CHANGERS	
15 to 50	220 or 440 to 220

MANUFACTURED BY ALLIS CHALMERS

- *Crated for immediate delivery*

AMERICAN ELECTRIC SERVICE & MAINTENANCE CO.
SPRINGFIELD, MASS.
MOTORS • GENERATORS • TRANSFORMERS • SALES • REPAIRS • RENTALS

FOR SALE

2—100 KW 250 volt DC Generators. Steam driven by Ball Engines—140# pressure.
1—200 KW 250 volt DC Generator. Steam driven by Ball Engine—140# pressure. Units complete with DC switchboard and two balancer sets.
1—20 ton York Vertical Ammonia Compressor. Steam driven by Corliss Engine —140# pressure.
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"Give us the tools..."

YOUR ONLY CHANCE of Getting Ahead

Where is the "brave new world" so glowingly promised us by the politicians during and after the war? We were told then that postwar America would live 50% better than it had before. Why has that promise faded out? Why are men today discouraged and frustrated?

We have not yet made good 1944's promises because the *American worker turns out no more in an hour now than he did in 1941.* We are getting more total production in our country – but only because we have more people working. Not because each one of us is producing more. American industry's ability to turn out more and more goods – with less of each worker's time and effort – has been stymied for eight long years.

Progress has been blocked because in some cases workers have not been willing to work as hard as they did before the war. In other cases unions restrict the use of labor-saving machines and methods. In some places obsolete building codes and ordinances prevent advances. In still other cases progress has been blocked by collusive practices between unions and manufacturers or operators.

But the biggest block to progress is the fact that our industry in the United States has been unable to provide our workers with all the new tools and equipment that they need.

Increasing productivity – that is, each one of us turning out more in each hour of work – is the key to higher living standards. Productivity depends directly upon the kind of tools workers use. His tools, more than anything else, determine how much a worker can turn out; and what his paycheck will buy depends in large part on what he turns out–not on how long or how hard he works.

Look what happened in our country in the forty years from 1900 to 1940. Productivity of the United States *more than doubled.* It doubled because:

Business investment in capital equipment gave workers new tools – tools that had three and one-half times as much power –

So – Americans' living standard rose almost 50% while the average work week was dropping from 61 to 43 hours.

Industry did continue to raise its output per man hour, even in the depressed 1930's. But it did it because, with unemployment widespread, companies used only their most efficient equipment. *Actually the great depression saw industry fall far behind in the job of providing workers with new tools.*

Then came World War II. Few new tools for peacetime industry were produced. *As a result of depression and war, the U.S. fell behind in needed investment in new industrial facilities by more than $100 billion.*

Since the war business has spent almost $60 billion for new plants and equipment –

But the greater part of that money went to *expand* production to take care of the needs of our bigger population, and to *replace* plants and equipment that were worn out and ready to be junked at the end of the war.

continued on next page

Only a small fraction of the $60 billion went to *modernize equipment* – the equipment that increases efficiency and improves productivity of the individual worker.

Right now industry is desperately trying to do the job of increasing efficiency of machines so that each worker can turn out more.

McGraw-Hill's national survey of Business' Needs for New Plants and Equipment shows that manufacturers plan right now to spend in the 5 years ahead three-quarters of their capital funds to replace and modernize facilities. The biggest part of the more than $55 billion industry plans to spend on its plants and equipment will go directly to improve efficiency of the individual.

If industry can carry through its plans – and expand them as it would like to and as it must do – the U. S. can catch up on its depression-war-time lag in progress within a few short years.

If American industry is allowed to earn the money to buy the equipment, it can raise the American standard of living 50% in our generation – in the next 25 years. No other nation can promise its people that much – and deliver on the promise.

But the promise can only be fulfilled by American industry. Wherever you turn, industry has dramatic new ways of doing things. Using oxygen by the ton, steel makers are increasing production from blast furnaces by 20%. New high-speed machine tools are doing three times the work of 1940 tools. A new coal-mining machine will multiply a miner's daily output 10 times. Diesel locomotives do the work of three steam locomotives on many jobs.

New products – and larger production of standard products – are already making their impact on American life. Two million Americans will get new television sets this year. Automatic washing machines, electric dishwashers, and home freezers are easing the daily tasks of thousands of housewives. Millions of homes that did not have them before the war now have telephones, automatic heat and refrigerators. Frozen foods, nylon clothing – these and many other things coming along now – will shape the *real* new world for Americans.

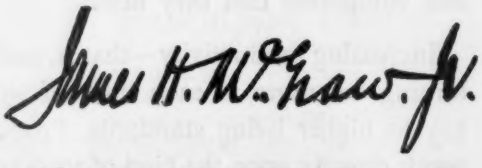
But industry can provide them only if it can keep on investing at least $15 billion a year now – and more in future years – in new plants and equipment.

Today Washington is taking a course which, if pursued, will make that investment by industry impossible. Government spending now strains our resources to the limit, and more multi-billion dollar spending proposals are being piled on. *But government spending cannot improve American living standards.* It never has, and it never will. Increasing government spending *now* will only block progress, because the government proposes to pay for its plans by taxing away the profits industry is using, and must continue to use, to improve and expand its plants and equipment – our only hope for greater worker productivity and higher living standards.

Better living can only be paid for with more production. And we can only get more production by increasing productivity – by each one of us producing more for each hour of work.

The first thing is to get the production – in peace and in war – for better living – for security. Industry is planning to provide it – and is using $13 billion of its profits this year to improve and expand its facilities.

The only sensible, the only safe national policy is to make it possible for American industry to do its job – not to terrorize private industry with proposals of ruinous taxation and paralyzing controls and threats of nationalization. For American industry is not a thing apart from the American people any more than is government. American industry is the lifeblood of the American people and whatever makes industry do its work better contributes more to the common welfare than a bureaucratic government can ever hope to do.



President, McGraw-Hill Publishing Company, Inc.

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